

Report 11406
22 February 1998

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**Integrated Advanced Microwave Sounding Unit-A
(AMSU-A)**

Performance Verification Report

AMSU-A1 Antenna Drive Subsystem

P/N 1331720-2, S/N 106

**Contract No. NAS 5-32314
CDRL 208**

Submitted to:

**National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771**

Submitted by:

**Aerojet
1100 West Hollyvale Street
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AMSU-A VERIFICATION TEST REPORT

TEST ITEM:	AMSU- A1 ANTENNA DRIVE SUBSYSTEM PART OF P/N: 1331720-2 SERIAL NUMBER : 106	
LEVEL OF ASSEMBLY:	SUBASSEMBLY AND COMPLETE INSTRUMENT ASSEMBLY	
TYPE HARDWARE:	FLIGHT	
VERIFICATION: PROCEDURE NO.	AE-26002/1D	
TEST DATE:		
SUBSYSTEM:	START DATE:	29 July 1998
	FINISH DATE:	10 Dec 1998

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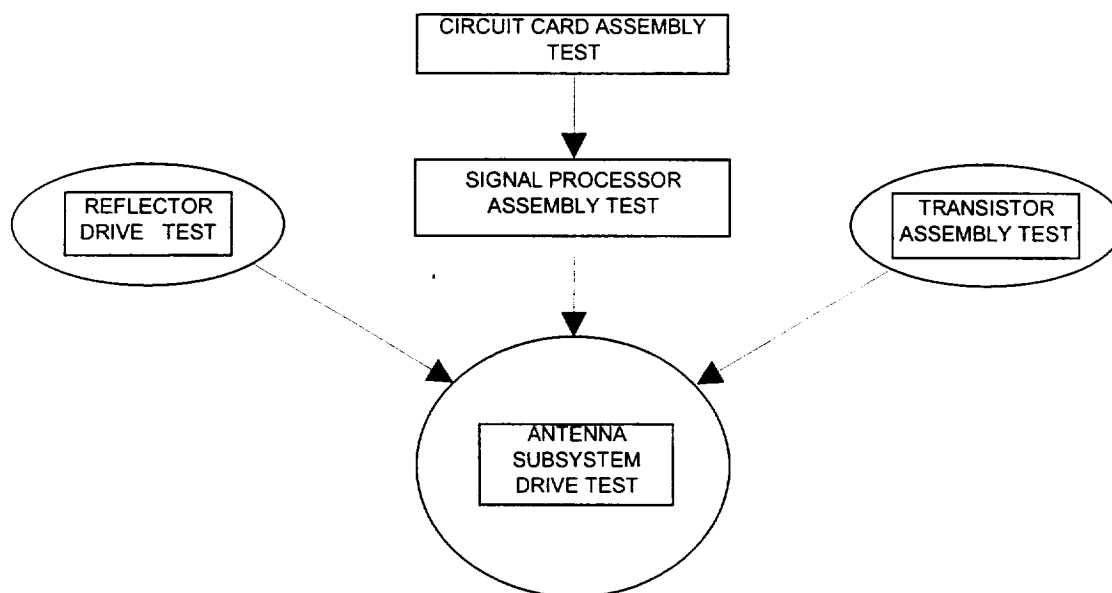
1.0 INTRODUCTION

An antenna drive subsystem test was performed on the METSAT AMSU-A1, S/N 106 instrument. The objective of the test was to demonstrate compliance with applicable paragraphs of AMSU-A specifications S-480-80. Tests were conducted at both the subassembly and instrument level.

2.0 SUMMARY

The antenna drive subsystem of the METSAT AMSU-A1, S/N 106, P/N 1331720-2, completed acceptance testing per AES Test Procedure AE-26002/1D. The test included: Scan Motion and Jitter, Pulse Load Bus Peak Current and Rise Time, Resolver Reading and Position Error, Gain/ Phase Margin, and Operational Gain Margin.

The drive motors and electronic circuitry were also tested at the component level. The drive motor test includes: Starting Torque Test, Motor Commutation Test, Resolver Operation/ No-Load Speed Test, and Random Vibration. The electronic circuitry was tested at the Circuit Card Assembly (CCA) level of production; each test exercised all circuit functions. The transistor assembly was tested during the W3 cable assembly (1356941-1) test. Refer to Figure 1 for test flow.



Antenna Subsystem and Subsystem Component Test Flow
Figure 1.

The antenna drive subsystem satisfactorily passed all of the performance requirements. There were no failures in any of the antenna drive components during subsystem testing.

The results of the subsystem and component level testing are discussed in more detail in the following sections:

Reflector Drive Assembly.....	5.1
Circuit Card Assemblies	5.2
Signal Processor.....	5.3
Transistor Assembly	5.4
Antenna Drive Subsystem.....	5.5

3.0 TEST CONFIGURATION

The ***Reflector Drive Assembly Tests*** confirm the operability of the motor under test. The test configuration includes, the motor, motor shaft, bearings, and a supporting housing.

The ***Circuit Card Assembly (CCA) Tests*** confirm the operability of each CCA. Each test includes the CCA under test, electronic test fixtures, and the necessary loads.

A segment of the ***Signal Processor Tests*** ensures the scan drive electronics are functioning properly prior to it's assembly into the instrument. The test configuration includes:

- Timing and Control CCA
- Scan Control Interface CCA
- Relay Driver and Current Monitor CCA
- Interface Converter CCA
- Resolver Data Isolator CCA
- R/D Converter CCA
- Motor Driver CCA
- Test fixture and cabling to simulate the spacecraft bus interface
- Test fixture and cabling to interrogate and analyze positional data
- Test motor and inertia wheel

The ***Transistor Assembly Test*** verifies the correct wiring of the transistor assembly and associated cabling. Test configuration includes the CKT 1000 (continuity and Hi-Pot tester), and test fixtures.

The Antenna Drive Subsystem Tests:

- Are configured with the same motor control CCA's used in the signal processor test, interconnecting wiring, the power transistor assembly, and the drive assembly with reflector.
- The antenna drive subsystem components were all installed in the instrument when the subsystem test was performed.

- DC power for the motor control circuit cards was provided by a DC/DC converter simulator P/N: 1359322-1. The simulator operates on 120VAC facility supplied power. The power for the reflector motor drive circuits however was provided directly by the STE 28V Bus power supply.

4.0 TEST SETUP

The antenna drive subsystem tests are performed during system integration. During system integration testing, the instrument is proven electrically safe via ground isolation, and power distribution checks. Next, the communication link is exercised to ensure commands are received and interpreted correctly. The Antenna Drive Subsystem Test is then performed.

5.0 TEST RESULTS

The Antenna Drive Subsystem components designated for use in the METSAT AMSU-A1 instrument are shown in Table 1.

CCA (A1-1)	S/N
Resolver Data Isolator Assembly (A1-1)	F29
Interface Converter Assembly (A1-1)	F32
Motor Driver Assembly (A1-1)	F03
R/D Converter/ Oscillator Assembly (A1-1)	F17

CCA (A1-2)	S/N
Resolver Data Isolator Assembly (A1-2)	F30
Interface Converter Assembly (A1-2)	F33
Motor Driver Assembly (A1-2)	F05
R/D Converter/ Oscillator Assembly (A1-2)	F20

OTHER	S/N
Reflector Drive Motor (A1-1)	F08
Reflector Drive Motor (A1-2)	F09
Signal Processor	F02
Transistor Assembly (W3 cable)	N/A

Table 1.
METSAT AMSU-A1 S/N: 106 Antenna
Subsystem Component S/N Designations

All components designated for use in the METSAT AMSU-A1 instrument (pertaining to the scan drive circuitry) passed on the first time through component testing.

5.1 REFLECTOR DRIVE ASSEMBLIES

The tests performed on this unit are: Starting Torque Test, Motor Commutation Test, Resolver Operation/ No-Load Speed Test, and Random Vibration. The Motor Commutation and Resolver Operation tests are performed both pre and post-vibration.

Starting Torque

The starting torque test is performed on the rotating segment of the drive assembly to verify the torque associated with bearing friction. Both reflector drive assemblies (F08 and F09) passed the starting torque test at ambient temperature as well as at the colder plateaus first time through testing.

Motor Commutation Test

This test is performed to determine the commutation characteristics of the motor under test. Both reflector drive assemblies (F08 and F09) passed the motor commutation test both pre- and post-vibration tests without incident.

Resolver Operation/ No-Load Speed Test

This test is performed to verify resolver operation as well as speed characteristics and back electromotive force of the motor. Both reflector drive assemblies (F08 and F09) passed the resolver operation/ no-load speed test both pre- and post-vibration tests without incident.

Random Vibration

Both reflector drive assemblies (F08 and F09) passed vibration testing first time through. The motor assembly also passed the pre- and post-vibration electronic tests as well as the post-vibration visual inspection without incident.

5.2 CIRCUIT CARD ASSEMBLIES

Test procedures were prepared for each motor control circuit card; document revision status is controlled by reference in the shop order. The cards were individually tested to the procedures and results were recorded on data sheets found in Appendix A. The following list indexes the CCA Test Data Sheets:

- *Appendix A1 Resolver Data Isolator Assembly (A1-1)*
- *Appendix A2 Resolver Data Isolator Assembly (A1-2)*
- *Appendix A3 Interface Converter Assembly (A1-1)*

- *Appendix A4..... Interface Converter Assembly (A1-2)*
- *Appendix A5..... Motor Driver Assembly (A1-1)*
- *Appendix A6..... Motor Driver Assembly (A1-2)*
- *Appendix A7..... R/D Converter/ Oscillator Assembly (A1-1)*
- *Appendix A8..... R/D Converter/ Oscillator Assembly (A1-2)*

All circuit card assemblies passed testing the first time through. The assembly build shop orders contain the part number and accept tag record the of test and select resistors.

5.3 SIGNAL PROCESSOR

For the first time, the entire antenna drive motor electronics is mated together. The test instrumentation commands and interrogates the electronics during this segment of testing. The instrumentation sends position commands to the Interface Converter CCA. The Interface Converter D/A's the command and provides inputs to the Motor Driver CCA. The test motor (instrumentation) responds to the drive signal and feeds back positional data via resolver outputs. The instrumentation then interrogates the Resolver Data Isolator CCA for position data. A comparison is made in the instrumentation between the position command sent and the actual position received. The pass/ fail indication is presented to the operator for test data sheet recording.

The signal processor assembly (F02) passed all scan drive tests.

5.4 TRANSISTOR ASSEMBLY

All transistor assemblies are tested along with their respective W3 cable. The cable is continuity, then hi-pot tested prior to attaching the transistor circuitry. Each transistor pair is exercised validating the turn on voltage, current drawn, and cable wiring as well.

The W3 cable and transistor assembly underwent component testing and passed without incident.

5.5 ANTENNA SUBSYSTEM DRIVE TESTS

The antenna drive motor electronics mates with the instrument microprocessor for the first time during this segment of testing. The microprocessor sends position commands from the memory CCA to the Interface Converter CCA. The Interface Converter D/A's the command and provides inputs to the Motor Driver CCA. The Reflector Drive Motor

responds to the drive signals and feeds back positional data via the resolver outputs. The microprocessor then interrogates the Resolver Data Isolator CCA for position data.. The microprocessor in turn communicates with the spacecraft interface.

During other segments of the test, positional data is monitored via a potentiometer attached to the shaft of each reflector drive assembly. This provides scan characteristic information in regard to overshoot, jitter, and beam position transition timing for each motor assembly.

The remaining paragraphs in this section discuss tests that ensures the instrument complies with specific operating parameters. Prior to conducting these tests there is a series of preliminary checks that are run to select component values that customize the operating parameters of each motor. These checks perform the following functions:

- Program “on board” memory with Beam Position Pointing Angles for each reflector drive assembly
- Adjust for peak Motor Current Limits on both A1-1 and A1-2 motor drive circuits
- Observe Preliminary Scan Dynamics on both A1-1 and A1-2 motor drive circuits
- Identify Mechanical Resonant Frequencies of each reflector drive assembly

Beam Position Pointing Angles are calculated from Nadir pointing direction which is determined on the antenna range. The instrument’s EPROMs (EPROMs for testing; PROMs for final configuration) are programmed to reflect the position commands. The initial programming may require fine tuning; fine tuning is determined during the remaining segments of the test procedure.

Motor Current Limits were adjusted, via selecting “test and select” resistors, to comply with the specification requirement; less than 1.1 amp peak current.

Preliminary Scan Dynamics looked good; transition times, overshoot and jitter were all acceptable at the sampled pointing directions (5).

The ***Mechanical Resonant Frequencies*** were identified; notch filters were calculated and installed to compensate for these resonant frequencies.

5.5.1 SCAN MOTION AND JITTER

In this test, the antenna position was measured in a series of five 8-sec full scans. The measurement was made with a 1-turn test potentiometer temporarily affixed to the rear end of the motor shaft. A Dynamic Signal Analyzer (DSA) was connected to the pot wiper to record the antenna position data.

During this test, an anomaly was discovered, and a Test Anomaly Record (TAR # 06398) was filed. It was observed that the A1 unit would not turn on correctly. In addition, there was no Dig A data stream coming back to the STE from the unit. The STE was changed, and the exact same results were observed. Subsequent investigation revealed that a bad U1 EPROM chip was installed. A new EPROM was programmed with the same code and was installed in the unit. Then a test was conducted, and the unit started to work correctly.

Five scans of each A1-1 and A1-2 were captured and stored on the AMSU-A1 Test Data File disc. One representative waveform from each subassembly is presented in Appendix B1 (A1-1) and Appendix B34 (A1-2).

Each 3.33 degrees scene step was expanded and checked for both a 35 msec max step time, and a 165 msec integration period. Expanded waveforms were plotted and are presented in Appendix B2 thru B31 for the A1-1 subassembly and Appendix B35 thru B64 for the A1-2 subassembly. All of the scene steps meet the step response requirement for transition time, overshoot, and jitter.

Slew periods to the cold and warm calibration stations were measured and met requirements. A time of 0.21 sec is allocated for the 35.0 degree slew to cold cal, and 0.40 sec for the 96.67 degree slew to warm cal. Calibration station jitter was less than the $\pm 5\%$ maximum permitted. Expanded waveforms for each subassembly were plotted and are presented in Appendix B32 and B33 (A1-1) and Appendix B65 and B66 (A1-2). The waveforms are also stored on the AMSU-A1 Test Data File disc. The test data sheets are presented in Appendix B67 (A1-1) and B68 (A1-2).

5.5.2 PULSE LOAD BUS PEAK CURRENT AND RISE TIME

The Pulse Load bus peak current and the rate of change of current were measured. The peak current must be less than 1.3A at any beam position along the scan. Peak current along the scan is 1.0356A. The current rate of change while transitioning from one beam position to the next (including the transition to the cold calibration and warm calibration targets) should be greater than 35 microseconds. A random 3.33° step was selected; the transition to the next step was 1.953 ms. The transition to the warm cal position start and stop was significantly longer than the required 35 ms; 2.344 and 4.687 ms respectively.

The peak bus current was measured across the entire scan and met the requirement. The full scan waveform was plotted and is presented in Appendix C1. The waveform is also stored on the AMSU-A1 Test Data File disc. The test data sheet is presented in Appendix C2.

5.5.3 RESOLVER READING AND POSITION ERROR

The 14-bit command position word is stored in the "on-board" memory and is read to the motor drive circuitry under microprocessor program control. The microprocessor also reads the resolver output at each of the thirty scene stations, and at the cold and warm calibration positions. The readings are made at the start of integration (LOOK 1), and halfway into the integration period (LOOK 2). The resolver data is sent to the spacecraft interface for subsequent transmission to the STE.

The purpose of this portion of the test is to demonstrate that the antenna is meeting beam pointing requirements.

If the antenna is out of the pointing tolerance of $> \pm 5$ counts at LOOK 2, the EPROM is reprogrammed to bring the pointing direction to within the prescribe tolerances. A copy of the STE computer print out showing the pointing direction is shown in Figure 2 for the A1-1 subassembly and Figure 3 for the A1-2 subassembly.

BP	Command	Actual		Difference*	
		Look 1	Look2	Look 1	Look2
1	192	193	193	1	1
2	344	349	344	5	0
3	496	501	497	5	1
4	647	652	649	5	2
5	799	802	800	3	1
6	951	953	951	2	0
7	1102	1106	1103	4	1
8	1254	1257	1255	3	1
9	1406	1411	1407	5	1
10	1557	1559	1556	2	-1
11	1709	1713	1709	4	0
12	1861	1864	1861	3	0
13	2012	2016	2014	4	2
14	2164	2167	2165	3	1
15	2316	2319	2316	3	0
16	2467	2471	2467	4	0

BP	Command	Actual		Difference*	
		Look 1	Look2	Look 1	Look2
17	2619	2622	2620	3	1
18	2771	2775	2771	4	0
19	2922	2927	2923	5	1
20	3074	3077	3075	3	1
21	3226	3230	3227	4	1
22	3377	3381	3379	4	2
23	3529	3532	3528	3	-1
24	3681	3685	3681	4	0
25	3832	3837	3833	5	1
26	3984	3987	3984	3	0
27	4136	4139	4136	3	0
28	4287	4291	4287	4	0
29	4439	4442	4440	3	1
30	4591	4594	4591	3	0
CC 1	6185	6186	6186	1	1
WC	10584	10585	10585	1	1

* Difference between Command and Actual

Figure 2. Beam Position Pointing Directions and Error Calculation for A1-1

BP	Command	Actual		Difference*	
		Look 1	Look2	Look 1	Look2
1	16112	16112	16112	0	0
2	16264	16272	16263	8	-1
3	32	41	31	9	-1
4	183	190	183	7	0
5	335	345	335	10	0
6	487	495	486	8	-1
7	638	647	638	9	0
8	790	800	790	10	0
9	942	950	941	8	-1
10	1093	1101	1093	8	0
11	1245	1255	1245	10	0
12	1397	1407	1397	10	0
13	1548	1557	1548	9	0
14	1700	1710	1700	10	0
15	1852	1861	1852	9	0
16	2003	2013	2003	10	0

BP	Command	Actual		Difference*	
		Look 1	Look2	Look 1	Look2
17	2155	2165	2155	10	0
18	2307	2316	2307	9	0
19	2458	2467	2458	9	0
20	2610	2620	2609	10	-1
21	2762	2772	2762	10	0
22	2913	2921	2912	8	-1
23	3065	3074	3065	9	0
24	3217	3225	3217	8	0
25	3368	3378	3368	10	0
26	3520	3531	3520	11	0
27	3672	3681	3671	9	-1
28	3823	3832	3823	9	0
29	3975	3986	3975	11	0
30	4127	4136	4127	9	0
CC 1	5721	5721	5721	0	0
WC	10120	10120	10120	0	0

* Difference between Command and Actual

Figure 3. Beam Position Pointing Directions and Error Calculation for A1-2

5.5.4 GAIN/PHASE MARGIN

A gain/phase margin test was performed on the antenna drive subsystem. The test was performed by obtaining a Bode plot of the control loop and measuring the gain at 180° phase differential and the phase margin at the 0db crossover point.

The Dynamic Signal Analyzer (DSA) was used to make the measurement operating in the swept sine mode. Three separate Bode plots were made on the antenna and the gain and phase margins were determined from each plot. The gain margin measured was 13.662 db (average of three) for the A1-1 subsystem and 13.044 db (average of three) for the A1-2 subsystem. The phase margin measured was 66.543° (average of three) for the A1-1 subsystem and 59.997° (average of three) for the A1-2 subsystem. These margins exceed the specification requirements of 9.2 db and 25 degrees and therefore are acceptable. The three Bode waveforms were plotted and are presented in Appendix D1 thru D3 for the A1-1 subsystem and Appendix D4 thru D6 for the A1-2 subsystem. The waveforms are also stored on the AMSU-A1 Test Data File disc. The test data sheets are presented in Appendix D7 and D8 for A1-1 and A1-2 respectively.

5.5.5 OPERATIONAL GAIN MARGIN

An operational gain margin test was performed on the instrument three times. This test consists of increasing the gain of the control loop until oscillation occurs. The gain increase and frequency of oscillation are measured. An increase in gain greater than 8 db is required; the frequency of oscillation is an observation.

A 50K pot was connected in series with the R58 feedback resistor on amplifier AR8. The resistance of the test pot was slowly added to the feedback resistor while observing the reflector for oscillations.

The reflector begins to produce an audible sound as gain is increased. The following added resistance values are calculated to have the following gain margins for the A1-1 and A1-2 subsystems:

Resistance (ohms)	Gain
35.93 K	9.0 db
37.34 K	9.2 db
37.39 K	9.2 db

A1-1

Resistance (ohms)	Gain
38.90 K	9.4 db
37.56 K	9.2 db
37.61 K	9.2 db

A1-2

The first mode mechanical resonance of the shaft and reflector is about 176 Hz for the A1-1 subsystem. The power spectrum waveform was plotted and is presented in Appendix E1. The first mode mechanical resonance of the shaft and reflector is about 181 Hz for the A1-2 subsystem. The power spectrum waveform was plotted and is presented in Appendix E2. These waveforms are also stored on the AMSU-A1 Test Data File disc. The test data sheets are presented in Appendix E3 and E4 for the A1-1 and A1-2 subsystems respectively.

6.0 CONCLUSION

Based on the test results, it can be concluded that the METSAT AMSU-A1 S/N 106 antenna drive subsystem meets the AMSU-A specification requirements.

7.0 TEST DATA

Test data for the METSAT AMSU-A1 S/N 106 obtained in the antenna drive subsystem test is attached. Data sheet number and type of test is shown in the following Appendix Index.

APPENDIX INDEX

<i>Appendix A1</i>	<i>Resolver Data Isolator CCA TDS (A1-1)</i>
<i>Appendix A2</i>	<i>Resolver Data Isolator CCA TDS (A1-2)</i>
<i>Appendix A3</i>	<i>Interface Converter CCA TDS (A1-1)</i>
<i>Appendix A4</i>	<i>Interface Converter CCA TDS (A1-2)</i>
<i>Appendix A5</i>	<i>Motor Driver CCA TDS (A1-1)</i>
<i>Appendix A6</i>	<i>Motor Driver CCA TDS (A1-2)</i>
<i>Appendix A7</i>	<i>R/D Converter/ Oscillator CCA TDS (A1-1)</i>
<i>Appendix A8</i>	<i>R/D Converter/ Oscillator CCA TDS (A1-2)</i>
<i>Appendix B1</i>	<i>Full Scan Step Response (A1-1)</i>
<i>Appendix B2 thru B31</i>	<i>Single Step Responses (A1-1)</i>
<i>Appendix B32</i>	<i>Cold Calibration Step Response (A1-1)</i>
<i>Appendix B33</i>	<i>Warm Calibration Step Response (A1-1)</i>
<i>Appendix B34</i>	<i>Full Scan Step Response (A1-2)</i>
<i>Appendix B35 thru B64</i>	<i>Single Step Responses (A1-2)</i>
<i>Appendix B65</i>	<i>Cold Calibration Step Response (A1-2)</i>
<i>Appendix B66</i>	<i>Warm Calibration Step Response (A1-2)</i>
<i>Appendix B67</i>	<i>Scan Motion Jitter Test TDS (A1-1)</i>
<i>Appendix B68</i>	<i>Scan Motion Jitter Test TDS (A1-2)</i>

Appendix C1..... Peak Pulse Load Bus Current Waveform

Appendix C2..... Pulse Load Bus Current TDS

Appendix D1 thru D3..... Gain/ Phase Margin Bode Plots (A1-1)

Appendix D4 thru D6..... Gain/ Phase Margin Bode Plots (A1-2)

Appendix D7..... Gain/ Phase Margin TDS (A1-1)

Appendix D8..... Gain/ Phase Margin TDS (A1-2)

Appendix E1 Operational Gain Margin Power Spectrum (A1-1)

Appendix E2 Operational Gain Margin Power Spectrum (A1-2)

Appendix E3 Operational Gain Margin TDS (A1-1)

Appendix E4 Operational Gain Margin TDS (A1-2)

APPENDIX A

***TEST DATA SHEETS FOR SCAN DRIVE CIRCUIT
CARD ASSEMBLIES***

TEST DATA SHEET B-6 (Sheet 1 of 2)

RESOLVER DATA ISOLATOR CCA (P/N 1334972) (Paragraph 6.6.7)

Date: 4/14/97
S/N: E-29
1334972-1

6.6.7.1 Supply Voltages

Supply*	Measured Value (V)	Limits (Vdc)	Pass/Fail
+5 V (I)	5.00	± 0.25	P
+5 V (U)	5.00	± 0.25	P

6.6.7.2 Supply Currents

Steps 1 and 2:

Supply*	Measured Value (mA)	Limits (mA)	Pass/Fail
+5 V (I)	53.24	100 max	P
+5 V (U)	324.71	400 max	P

Steps 3 and 4:

Supply*	Measured Value (mA)	Limits (mA)	Pass/Fail
+5 V (I)	83.48	150 max	P
+5 V (U)	11.18	30 max	P

* I = Isolated, U = Unisolated

6.6.7.3 Resolver Data

Bit No.	Pass/Fail
API 0 - AP Bit 0	P
API 1 - AP Bit 1	P
API 2 - AP Bit 2	P
API 3 - AP Bit 3	P
API 4 - AP Bit 4	P
API 5 - AP Bit 5	P
API 6 - AP Bit 6	P
API 7 - AP Bit 7	P
API 8 - AP Bit 8	P
API 9 - AP Bit 9	P
API 10 - AP Bit 10	P
API 11 - AP Bit 11	P
API 12 - AP Bit 12	P
API 13 - AP Bit 13	P

6.6.7.4 Converter Busy Pulse

Converter Busy Pulse	Measured Value (μ sec)	Limits (μ sec)	Pass/Fail
15.0	14.8	± 3.0	P

TEST DATA SHEET B-6 (Sheet 2 of 2)

RESOLVER DATA ISOLATOR CCA (P/N 1334972) (Paragraph 6.6.7)

Comments:

NONE

Conducted by:

Dennis Lim
Test Engineer

4/14/97
Date

Verified by:

Judith Harvey
Quality Control Inspector

4-14-97
Date

Approved by:

[Signature]
DCMC

4/14/97
Date

TEST DATA SHEET B-6 (Sheet 1 of 2)

RESOLVER DATA ISOLATOR CCA (P/N 1334972) (Paragraph 6.6.7)

Date: 4/14/97
S/N: F-30
1334972-1
6.6.7.1 Supply Voltages

Supply*	Measured Value (V)	Limits (Vdc)	Pass/Fail
+5 V (I)	5.00	±0.25	P
+5 V (U)	5.01	±0.25	P

6.6.7.2 Supply Currents

Steps 1 and 2:

Supply*	Measured Value (mA)	Limits (mA)	Pass/Fail
+5 V (I)	53.26	100 max	P
+5 V (U)	319.34	400 max	P

Steps 3 and 4:

Supply*	Measured Value (mA)	Limits (mA)	Pass/Fail
+5 V (I)	83.40	150 max	P
+5 V (U)	11.12	30 max	P

* I = Isolated, U = Unisolated

6.6.7.3 Resolver Data

Bit No.	Pass/Fail
API 0 - AP Bit 0	P
API 1 - AP Bit 1	P
API 2 - AP Bit 2	P
API 3 - AP Bit 3	P
API 4 - AP Bit 4	P
API 5 - AP Bit 5	P
API 6 - AP Bit 6	P
API 7 - AP Bit 7	P
API 8 - AP Bit 8	P
API 9 - AP Bit 9	P
API 10 - AP Bit 10	P
API 11 - AP Bit 11	P
API 12 - AP Bit 12	P
API 13 - AP Bit 13	P

6.6.7.4 Converter Busy Pulse

Converter Busy Pulse	Measured Value (µsec)	Limits (µsec)	Pass/Fail
15.0	14.65	±3.0	P

10 Feb 97

TEST DATA SHEET B-6 (Sheet 2 of 2)

RESOLVER DATA ISOLATOR CCA (P/N 1334972) (Paragraph 6.6.7)

Comments:

NONE

Conducted by:

Dennis Lee
Test Engineer

4/14/97
Date

Verified by:

Judith Harvey
Quality Control Inspector

4-14-97
Date

Approved by:

[Signature]
DCMC

4/16/97
Date

TEST DATA SHEET B-13 (Sheet 1 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

Date: 8/19/97
CCA S/N: F32
1331697-1

6.13.7.1 Supply Voltages

Supply	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
+5V (U)	5.01	+5V \pm 0.05	P
+15V (I)	15.01	+15V \pm 0.15	P
-15V (I)	-14.97	-15V \pm 0.15	P
+5V (I)	5.02	+5V \pm 0.05	P

6.13.7.2 Supply Currents

Step 1 (CP and API Low):

Supply	Measured Value (mA)	Limits (mA)	Pass/Fail
+5V (U)	86.48	70 - 110	P
+5V (I)	3.34	1.5 - 5.5	P
+15V (I)	17.54	15 - 23	P
-15V (I)	20.21	18 - 26	P

Step 2 (CP and API High):

Supply	Measured Value (mA)	Limits (mA)	Pass/Fail
+5V (U)	56.46	40 - 70	P
+5V (I)	23.90	18 - 30	P
+15V (I)	17.54	15 - 23	P
-15V (I)	20.20	18 - 26	P

6.13.7.3 Amplifier Offsets

Amplifier	Measured Value (mV)	Limits (mV)	Pass/Fail
AR1	-0.03	0.0 \pm 0.15	P
AR2	+0.07	0.0 \pm 2.0	P

TEST DATA SHEET B-13 (Sheet 2 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

6.13.7.4 Subtraction and D-A Conversion

Step 1:

unturned
9-10-97
 ± 0.00015
 ± 0.00060
 ± 0.00030

Actual Position (API) MSB LSB	Command Position (CP) MSB LSB	ARI Output Voltage Required (Vdc)	Test Result (Vdc)	Pass/Fail
00000000000000	00000000000000	0.00000	-0.00001	P
00000000000001	00000000000000	-0.00061	-0.000540	P
00000000000010	00000000000000	-0.00122	-0.001159	P
00000000000011	00000000000000	-0.00184	-0.001798	P
00000000000100	00000000000000	-0.00245	-0.002417	P
00000000000100	00000000000000	-0.00490 *	-0.004914	P
00000000000100	00000000000000	-0.00979 *	-0.009915	P
00000000000100	00000000000000	-0.01958 *	-0.019902	P
00000000000100	00000000000000	-0.03917 *	-0.039872	P
00000000000100	00000000000000	-0.07834 *	-0.079819	P
00000000000100	00000000000000	-0.15667 *	-0.15970	P
00000000000100	00000000000000	-0.31334 *	-0.31947	P
00000000000100	00000000000000	-0.62669 *	-0.63909	P
00000000000100	00000000000000	-1.25338 *	-1.2783	P
00000000000100	00000000000000	-2.50675 *	-2.5567	P
00000000000100	00000000000000	-5.01350 *	-5.1135	P

* Tolerance on output voltage is $\pm 10\%$

Step 2:

unturned
9-10-97
 ± 0.00015
 ± 0.00060
 ± 0.00030

Actual Position (API) MSB LSB	Command Position (CP) MSB LSB	ARI Output Voltage Required (Vdc)	Test Result (Vdc)	Pass/Fail
00000000000000	00000000000000	0.00000	-0.000032	P
00000000000000	00000000000001	0.00061	+0.000577	P
00000000000000	00000000000010	0.00122	+0.001210	P
00000000000000	00000000000011	0.00184	+0.001822	P
00000000000000	000000000000100	0.00245	+0.002450	P
00000000000000	000000000000100	0.00490 *	+0.004949	P
00000000000000	000000000000100	0.00979 *	+0.009967	P
00000000000000	000000000000100	0.01958 *	+0.019954	P
00000000000000	000000000000100	0.03917 *	+0.039927	P
00000000000000	000000000000100	0.07834 *	+0.079873	P
00000000000000	000000000000100	0.15667 *	+0.15980	P
00000000000000	000000000000100	0.31334 *	+0.31964	P
00000000000000	000000000000100	0.62669 *	+0.63932	P
00000000000000	000000000000100	1.25338 *	+1.2781	P
00000000000000	000000000000100	2.50675 *	+2.5565	P
00000000000000	000000000000100	-5.01350 *	-5.1135	P

* Tolerance on output voltage is $\pm 10\%$

19 Jun 97

TEST DATA SHEET B-13 (Sheet 3 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

6.13.7.5 Strobe FunctionStep 1: Strobe LowNo E11 Change
with Input CP ChangesPass/FailPStep 2: Strobe HighE11 Change
with Input CP ChangesPass/FailP6.13.7.6 Amplifier Gain

	<u>Measured Value (Vdc)</u>	<u>Limits (Vdc)</u>	<u>Pass/Fail</u>
E11	<u>0.31971</u>	-	<u>P</u>
E10	<u>3.5173</u>	-	<u>P</u>
<u>E10 Voltage</u> <u>E11 Voltage</u>	<u>11.0</u>	10.7 - 11.3	<u>P</u>

6.13.7.7 Ground Isolation

	<u>Measured Value (MΩ)</u>	<u>Limits (MΩ)</u>	<u>Pass/Fail</u>
Pin 91 to Pin 7 DC Resistance	<u>> 200MΩ</u>	>20	<u>P</u>

Comments:

NONE

Conducted by:

Dennis Linn
Test Engineer8/19/97
Date
OCT 10 '97

Verified by:

Richard H. Hutt (74)
Quality Control Inspector 190

Date

Approved by:

Richard Thomas
DCMC10/24/97
Date

TEST DATA SHEET B-13 (Sheet 1 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

Date: 8/16/97
CCA S/N: F33
1331697-1

6.13.7.1 Supply Voltages

Supply	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
+5V (U)	5.02	+5V \pm 0.05	P
+15V (I)	15.01	+15V \pm 0.15	P
-15V (I)	-14.97	-15V \pm 0.15	P
+5V (I)	5.02	+5V \pm 0.05	P

6.13.7.2 Supply Currents

Step 1 (CP and API Low):

Supply	Measured Value (mA)	Limits (mA)	Pass/Fail
+5V (U)	86.57	70 - 110	P
+5V (I)	3.36	1.5 - 5.5	P
+15V (I)	17.65	15 - 23	P
-15V (I)	20.45	18 - 26	P

Step 2 (CP and API High):

Supply	Measured Value (mA)	Limits (mA)	Pass/Fail
+5V (U)	56.47	40 - 70	P
+5V (I)	23.92	18 - 30	P
+15V (I)	17.65	15 - 23	P
-15V (I)	20.45	18 - 26	P

6.13.7.3 Amplifier Offsets

Amplifier	Measured Value (mV)	Limits (mV)	Pass/Fail
AR1	+0.05	0.0 \pm 0.15	P
AR2	-0.15	0.0 \pm 2.0	P

TEST DATA SHEET B-13 (Sheet 2 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

6.13.7.4 Subtraction and D-A Conversion

Step 1:

unfulfilled
9-10-97
 ± 0.00015
 ± 0.00060
 ± 0.00030

Actual Position (API) MSB LSB	Command Position (CP) MSB LSB	ARI Output Voltage Required (Vdc)	Test Result (Vdc)	Pass/Fail
00000000000000	00000000000000	0.00000	0.00006	P
00000000000001	00000000000000	-0.00061	-0.000477	P
00000000000010	00000000000000	-0.00122	-0.001120	P
00000000000011	00000000000000	-0.00184	-0.001767	P
00000000000100	00000000000000	-0.00245	-0.002413	P
00000000001000	00000000000000	-0.00490 *	-0.004975	P
00000000010000	00000000000000	-0.00979 *	-0.010095	P
00000000100000	00000000000000	-0.01958 *	-0.020351	P
00000001000000	00000000000000	-0.03917 *	-0.040856	P
00000010000000	00000000000000	-0.07834 *	-0.081369	P
00000100000000	00000000000000	-0.15667 *	-0.16388	P
00001000000000	00000000000000	-0.31334 *	-0.32795	P
00010000000000	00000000000000	-0.62669 *	-0.65614	P
00100000000000	00000000000000	-1.25338 *	-1.3126	P
01000000000000	00000000000000	-2.50675 *	-2.6254	P
10000000000000	00000000000000	-5.01350 *	-5.2509	P

* Tolerance on output voltage is $\pm 10\%$

Step 2:

unfulfilled
9-10-97
 ± 0.00015
 ± 0.00060
 ± 0.00030

Actual Position (API) MSB LSB	Command Position (CP) MSB LSB	ARI Output Voltage Required (Vdc)	Test Result (Vdc)	Pass/Fail
00000000000000	00000000000000	0.00000	0.00006	P
00000000000001	00000000000000	0.00061	0.000697	P
00000000000010	00000000000000	0.00122	0.001337	P
00000000000011	00000000000000	0.00184	0.001970	P
00000000000100	00000000000000	0.00245	0.002615	P
00000000000100	00000000000000	0.00490 *	0.005186	P
00000000000100	00000000000000	0.00979 *	0.010344	P
00000000000100	00000000000000	0.01958 *	0.020595	P
00000000000100	00000000000000	0.03917 *	0.041102	P
00000000000100	00000000000000	0.07834 *	0.082114	P
00000000000100	00000000000000	0.15667 *	0.16420	P
00000000000100	00000000000000	0.31334 *	0.32832	P
00000000000100	00000000000000	0.62669 *	0.65668	P
00000000000100	00000000000000	1.25338 *	1.3127	P
00000000000100	00000000000000	2.50675 *	2.6254	P
00000000000100	00000000000000	-5.01350 *	-5.2509	P

* Tolerance on output voltage is $\pm 10\%$

TEST DATA SHEET B-13 (Sheet 3 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

6.13.7.5 Strobe Function

Step 1: Strobe Low

No E11 Change
with Input CP Changes

Pass/Fail

P

Step 2: Strobe High

E11 Change
with Input CP Changes

Pass/Fail

P

6.13.7.6 Amplifier Gain

	<u>Measured Value (Vdc)</u>	<u>Limits (Vdc)</u>	<u>Pass/Fail</u>
E11	<u>0.32832</u>	-	<u>P</u>
E10	<u>3.6083</u>	-	<u>P</u>
<u>E10 Voltage</u> <u>E11 Voltage</u>	<u>11.0</u>	10.7 - 11.3	<u>P</u>

6.13.7.7 Ground Isolation

	<u>Measured Value (MΩ)</u>	<u>Limits (MΩ)</u>	<u>Pass/Fail</u>
Pin 91 to Pin 7 DC Resistance	<u>> 60MΩ</u>	>20	<u>P</u>

Comments:

NONE

Conducted by:

Dennis Lee
Test Engineer

8/16/97
Date

Verified by:

Michael Stubb
Quality Control Inspector

OCT 10 '97
Date

Approved by:

Russell Thomas
DCMC

10/14/97
Date

TEST DATA SHEET B-4 (Sheet 1 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

S/N: F03
Date: 4/30/97
1331694-3
6.4.3.2 Input Signal Offset

Step No.	Test Results	Limits
4	-1.14 mV	0.0 ± 1 mVdc
6	-1.60 mV	0.0 ± 1 mVdc
8	-1.47 mV	0.0 ± 1 mVdc

Step No.	Test Resistor	Resistance Measured
13	E7-E8 (R25)	3.16K
	E9-E10 (R52)	4.60K
	E11-E12 (R33)	3.16K
	E13-E14 (R53)	5.65K
	E15-E16 (R42)	3.16K
	E17-E18 (R54)	5.18K

Step No.	Resistors	Selected Trim Resistors
14	R25	RNC55J3161FS
	R52	RNC55J4531FS
	R33	RNC55J3161FS
	R53	RNC55J5621FS
	R42	RNC55J3161FS
	R54	RNC55J5231FS

Step No.	E Point	Test Results	Limits	Pass/Fail
19	E19	0.09 mV	0.0 ± 1 mVdc	P
	E20	0.02 mV	0.0 ± 1 mVdc	P
	E21	-0.03 mV	0.0 ± 1 mVdc	P

6.4.3.3 Motor Driver Operation

Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
2	4.93V	+5V ± 0.05Vdc	P
	51.4 mA	70mA dc max	P
	15.07V	+15V ± 0.15Vdc	P
	1.5 mA	3.0mA dc max	P
	-14.98V	-15V ± 0.15Vdc	P
	18.7 mA	25mA dc max	P
	+28.10V	+28V ± 0.5Vdc	P
	5.6 mA	8mA dc max	P
3	275 mV	400mVdc max	P
4	41.9 mA	50mA dc max	P
5	47.6 mA	50mA dc max	P

10 Feb 97

TEST DATA SHEET B-4 (Sheet 2 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

Counter Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
3	273 mV	400mVdc max	P
4	36.4 mA	50mAdc max	P
5	40.2 mA	50mAdc max	P

6.4.3.4 Current Limit Test

Step No.	Test Results	Limits	Pass/Fail
3 2	453 mA	350-500mAdc	P

unthummed
3-3-97



2/3/97

Comments:

NONE

Conducted by:

Dennis Lee
Test Engineer

4/30/97
Date

Verified by:

Judith Hervey
Quality Control Inspector



5-3-97
Date

Approved by:

Dennis Lee
DCMC

10/8/97
Date

TEST DATA SHEET B-4 (Sheet 1 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

S/N: F05
 Date: 8/21/97
1331694-3

6.4.3.2 Input Signal Offset

Step No.	Test Results	Limits
4	1.12 mV	0.0 ± 1 mVdc
6	1.11 mV	0.0 ± 1 mVdc
8	1.14 mV	0.0 ± 1 mVdc

Step No.	Test Resistor	Resistance Measured
13	E7-E8 (R25)	3.16 k
	E9-E10 (R52)	4.75 k
	E11-E12 (R33)	3.16 k
	E13-E14 (R53)	4.75 k
	E15-E16 (R42)	3.16 k
	E17-E18 (R54)	4.75 k

Step No.	Resistors	Selected Trim Resistors
14	R25	RNC55J 3161FS
	R52	RNC55J 4751FS
	R33	RNC55J 3161FS
	R53	RNC55J 4751FS
	R42	RNC55J 3161FS
	R54	RNC55J 4751FS

Step No.	E Point	Test Results	Limits	Pass/Fail
19	E19	-0.076 mV	0.0 ± 1 mVdc	PASS
	E20	-0.047 mV	0.0 ± 1 mVdc	PASS
	E21	-0.034 mV	0.0 ± 1 mVdc	PASS

6.4.3.3 Motor Driver Operation

Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
2	5.01 V	+5V ± 0.05Vdc	PASS
	52.6 mA	70mA dc max	PASS
	15.01 V	+15V ± 0.15Vdc	PASS
	1.55 mA	3.0mA dc max	PASS
	-14.97 V	-15V ± 0.15Vdc	PASS
	18.92 mA	25mA dc max	PASS
	27.99 V	+28V ± 0.5Vdc	PASS
	5.61 mA	8mA dc max	PASS
3	28 cmV	400mVdc max	PASS
4	42 mA	50mA dc max	PASS
5	47 mA	50mA dc max	PASS

TEST DATA SHEET B-4 (Sheet 2 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

Counter Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
3	281 mV	400mVdc max	PASS
4	37 mA	50mAdc max	PASS
5	41 mA	50mAdc max	PASS

6.4.3.4 Current Limit Test

Step No.	Test Results	Limits	Pass/Fail
3	460 mA	350-500mAdc	PASS

Comments:

NONE

Conducted by:

Dennis Lin
Test Engineer

8/21/97
Date

Verified by:

Judith Horvay
Quality Control Inspector

09/03/97
Date

Approved by:

Dennis Lin
DCMC

9/3/97
Date

TEST DATA SHEET B-5 (Sheet 1 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

Date 3/14/97
 CCA S/N F17
1337739-1

6.5.7.1 UUT Pre-Test

Step 2:

Supply Currents (Without UUT)

Supply (Vdc)	(Baseline) Measured Value (mA) (Without UUT)	Limits (mA)	Pass/Fail
+15	0.06 mA	0-1	P
-15	-0.28 mA	-1 - 0	P
+5	0.06 mA	0-1	P

Supply Voltages (Without UUT)

Supply	Measured Value (V)	Limits (V)	Pass/Fail
+15V (I)	15.02 V	± 0.50	P
-15V (I)	-15.01 V	± 0.50	P
+5V (I)	5.03 V	±0.25	P

Step 6:

Supply Currents (UUT Installed)

Supply (Vdc)	Measured Value (mA) (UUT Installed)	Difference (mA) (Measured - Baseline)	Limits (mA)	Pass/Fail
+15	33.57 mA	33.51 mA	20-40	P
-15	-41.75 mA	-41.47 mA	-30 - -50	P
+5	59.76 mA	59.70 mA	30-70	P

6.5.7.2 Supply Voltages (UUT Installed)

Supply	Measured Value (V)	Limits (V)	Pass/Fail
+15V (I)	15.01 V	± 0.50	P
-15V (I)	-14.96 V	± 0.50	P
+5V (I)	5.02 V	±0.25	P

6.5.7.3 Oscillator Frequency, Duty Cycle, and Output Voltage

Parameter	Measured Value	Limits	Pass/Fail
Frequency	1598 Hz	1550-1650 Hz	P
Duty Cycle	52 %	45-55 %	P
Output Voltage	8.052 VRMS	7.6-8.4 Vrms	P

TEST DATA SHEET B-5 (Sheet 2 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

6.5.7.4 R-D Converter Operation

Step 1:

Bit Number/ Test Fixture Label	CW Pass/Fail	CCW Pass/Fail
API 0/1	P	P
API 1/2	P	P
API 2/3	P	P
API 3/4	P	P
API 4/5	P	P
API 5/6	P	P
API 6/7	P	P
API 7/8	P	P
API 8/9	P	P
API 9/10	P	P
API 10/11	P	P
API 11/12	P	P
API 12/13	P	P
API 13/14	P	P
Converter Busy	P	P

Step 2:

unsummed 3-4-97

PES-RS RS (E10)	Measured Value (Vdc)	Calculated Value (Vdc) * CCA -1 Assy	Calculated Value (Vdc) * CCA -2 Assy	Pass/Fail
CW Rotation**	-11.58V	-11.79V	N/A	P
CCW Rotation**	-1.86V	-1.79V	N/A	P

* Signal level function of test and calibration gain resistors. Record calculated value and measured value. Measured value shall be within ± 10 percent of calculated value. The equation is as follows:

$$V = 0.155 \left(\frac{R20}{R17} \right) \pm 23\%$$

R20 = 59k
R17 = 5.11k
DLN 5/4/97

6.5.7.5 Amplifier Gain

PES-RS	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
PES = +0.300 Vdc	DLN 1.07V	1.00 to 1.30	P
PES = -0.300 Vdc	1.06V	1.00 to 1.30	P

6.5.7.6 Direction Control Signal

DIR CNTRL	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
CCW Rotation	5.00V	4.5 to 5.5	P
CCW Rotation	0.128V	0.0 to 0.4	P

TEST DATA SHEET B-5 (Sheet 3 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

6.5.7.7 Notch Filter Frequency Response

Frequency	Measured Value (Hz)	Calculated Value (Hz) * CCA -1 Assy	Calculated Value (Hz) * CCA -2 Assy	Pass/Fail
AR3 Notch	N/A	N/A	N/A	N/A
AR4 Notch	N/A	N/A	N/A	N/A
AR5 Notch	N/A	N/A	N/A	N/A

* Notch frequencies shall be within ± 3 percent of values determined by test and calibration resistors. Record calculated and measured values.

Comments:

NONE

Note

this test shall be performed at the system level during antenna drive subsystem level testing.

W. Hummel

3-4-97



Conducted by:

Dennis Lin
Test Engineer

5/14/97
Date

Verified by:

Judith Hervey
Quality Control Inspector

5/15/97
Date

Approved by:

Emily L. Gmewski
DEMC

5/15/97
Date

TEST DATA SHEET B-5 (Sheet 1 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

Date 8/27/97
CCA S/N F20
1337739-1

6.5.7.1 UUT Pre-Test

Step 2:

Supply Currents (Without UUT)

Supply (Vdc)	(Baseline) Measured Value (mA) (Without UUT)	Limits (mA)	Pass/Fail
+15	0.06	0-1	P
-15	-0.28	-1 - 0	P
+5	0.06	0-1	P

Supply Voltages (Without UUT)

Supply	Measured Value (V)	Limits (V)	Pass/Fail
+15V (I)	+15.02	± 0.50	P
-15V (I)	-15.01 <i>0.44</i>	± 0.50	P
+5V (I)	5.03	±0.25	P

Step 6:

Supply Currents (UUT Installed)

Supply (Vdc)	Measured Value (mA) (UUT Installed)	Difference (mA) (Measured - Baseline)	Limits (mA)	Pass/Fail
+15	32.85	32.79	20-40	P
-15	-41.27	-40.99	-30 - -50	P
+5	57.36	57.30	30-70	P

6.5.7.2 Supply Voltages (UUT Installed)

Supply	Measured Value (V)	Limits (V)	Pass/Fail
+15V (I)	15.01	± 0.50	P
-15V (I)	-14.96	± 0.50	P
+5V (I)	5.02	±0.25	P

6.5.7.3 Oscillator Frequency, Duty Cycle, and Output Voltage

Parameter	Measured Value	Limits	Pass/Fail
Frequency	1610 Hz	1550-1650 Hz	P
Duty Cycle	51.3 %	45-55 %	P
Output Voltage	7.97V	7.6-8.4 Vrms	P

TEST DATA SHEET B-5 (Sheet 2 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

6.5.7.4 R-D Converter Operation

Step 1:

Bit Number/ Test Fixture Label	CW Pass/Fail	CCW Pass/Fail
API 0/1	P	P
API 1/2	P	P
API 2/3	P	P
API 3/4	P	P
API 4/5	P	P
API 5/6	P	P
API 6/7	P	P
API 7/8	P	P
API 8/9	P	P
API 9/10	P	P
API 10/11	P	P
API 11/12	P	P
API 12/13	P	P
API 13/14	P	P
Converter Busy	P	P

Step 2:

RS (E10)	Measured Value (Vdc)	Calculated Value (Vdc) * CCA -1 Assy	Calculated Value (Vdc) * CCA -2 Assy	Pass/Fail
CW Rotation**	1.496	(+) 1.790	(+) N/A	P
CCW Rotation**	-1.764	(-) 1.790	(-) N/A	P

* Signal level function of test and calibration gain resistors. Record calculated value and measured value. Measured value shall be within $\pm 10\%$ percent of calculated value. The equation is as follows:

$$V = \pm 0.155 \left(\frac{R20}{R17} \right) \pm 10\% = .155 \left(\frac{59K}{5.11K} \right) = 1.79V$$

unfurnished
8-26-97

6.5.7.5 Amplifier Gain

PES-RS	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
PES = +0.300 Vdc	1.179	1.00 to 1.30	P
PES = -0.300 Vdc	1.059	1.00 to 1.30	P

6.5.7.6 Direction Control Signal

DIR CNTRL	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
CW Rotation	5.000	4.5 to 5.5	P
CCW Rotation	0.117	0.0 to 0.4	P

TEST DATA SHEET B-5 (Sheet 3 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

6.5.7.7 Notch Filter Frequency Response

Frequency	Measured Value (Hz)	Calculated Value (Hz) * CCA -1 Assy	Calculated Value (Hz) * CCA -2 Assy	Pass/Fail
AR3 Notch	N/A	N/A	N/A	N/A
AR4 Notch	1	1	1	1
AR5 Notch				

* Notch frequencies shall be within ± 3 percent of values determined by test and calibration resistors. Record calculated and measured values.

Comments:

NONE

Conducted by:

Test Engineer

Date

Verified by:

Quality Control Inspector

Date

Approved by:

DCMC

Date

APPENDIX B

SCAN MOTION AND JITTER RESPONSE PLOTS

Time Captured

MEASURE:

CHAN 1 CHAN 2
Power Spec Off

WINDOW:

CHAN 1 CHAN 2
Hanning Hanning

AVERAGE:

TYPE TYPE # AVG OVERLAP TIME
Avg Off 10 Off

FREQ:

CENTER SPAN BW
50 Hz 100 Hz 187 MHz

TRIGGER:

TYPE LEVEL SLOPE
External 1.0 Vpk Neg

INPUT:

RANGE ENG UNITS COUPLING DELAY
CH 1 AutoRng↑ 1.0 V/EU DC (Gnd) 0.0 S
CH 2 AutoRng↑ 1.0 V/EU DC (Gnd) 0.0 S

SOURCE:

TYPE LEVEL OFFSET
Off 0.0 Vpk 0.0 Vpk

SCAN MOTION AND JITTER 7A
3A.45-7S

S/O: 373249

Test Eng:

Date: 8-18-98

P/N: 1331720-2-II

SN: 106

Quality: 8.88.28

CAP TIM BUF
36.0

4.5

/DIV

Real

V

0.0

FxdXY D.O

Sec

7AP_F551

8.1

SID 373249

AN 1331720-2-IT SN' 106

37.7.5. A1-1

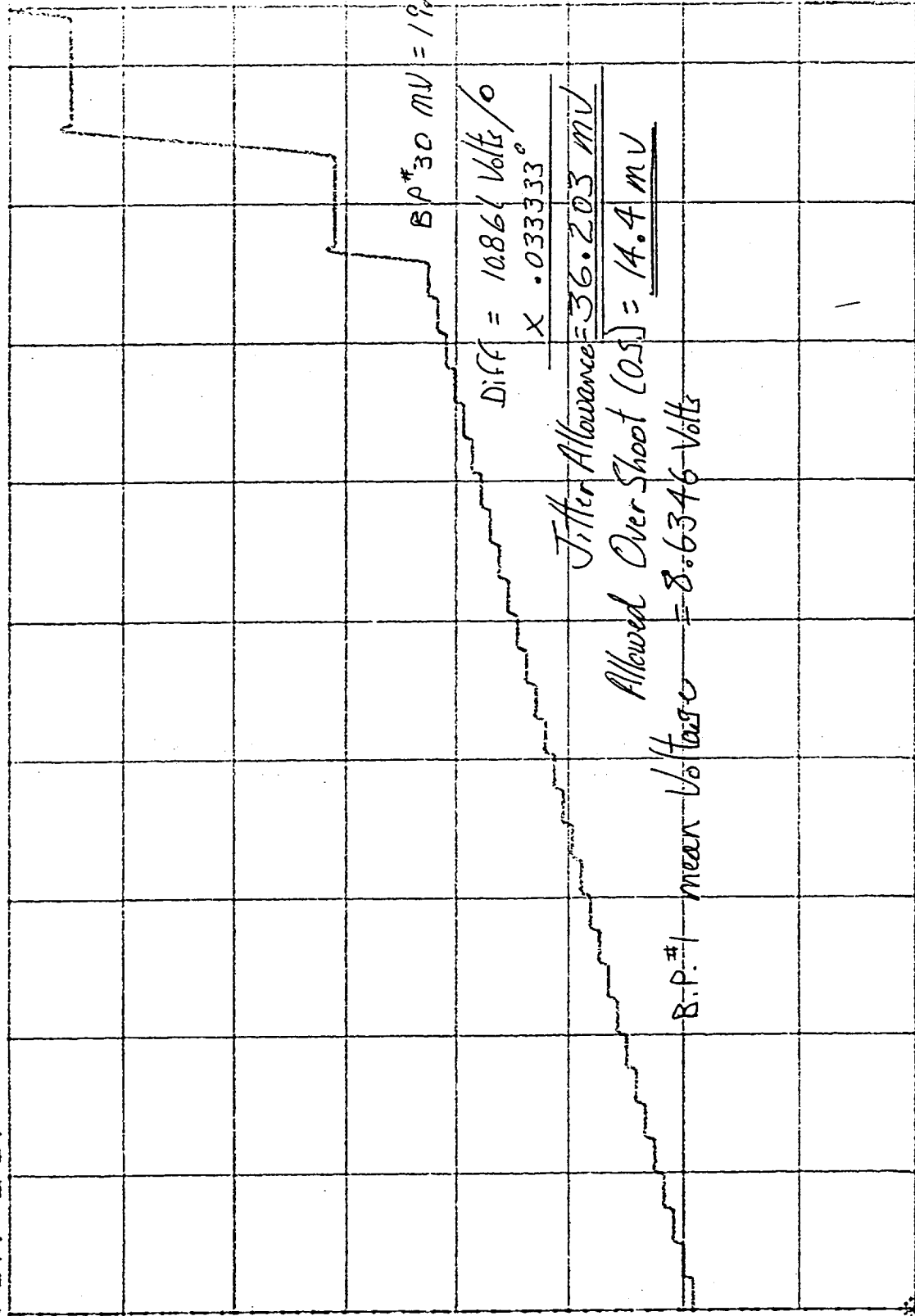
Test Eng:

Quality: 7A 269

Date: 8-18-98

8-22-98

B1



X=0.0 S 63621 ΔX=199.2ms Y=8.61945 ΔY=27.99mV
CAP TIM BUF
0.50

051

105

 \geq

404

EXXY O.O. SCENE / 7AP F51

S/o: 373249

3.4.4.5 A.1-1

P/N: 1331729-2-17 SW: 106

SEIT 8 JAHREN

Test Eng.

Quint.

Date: 8-18-98

25. 10 11

7A 268

$X=187.5ms$ $\Delta X=230.5ms$ $Y=8.98448$ $\Delta Y=36.36mV$
 $Y_0=8.66703$ $\Delta Y_0=710.4mV$

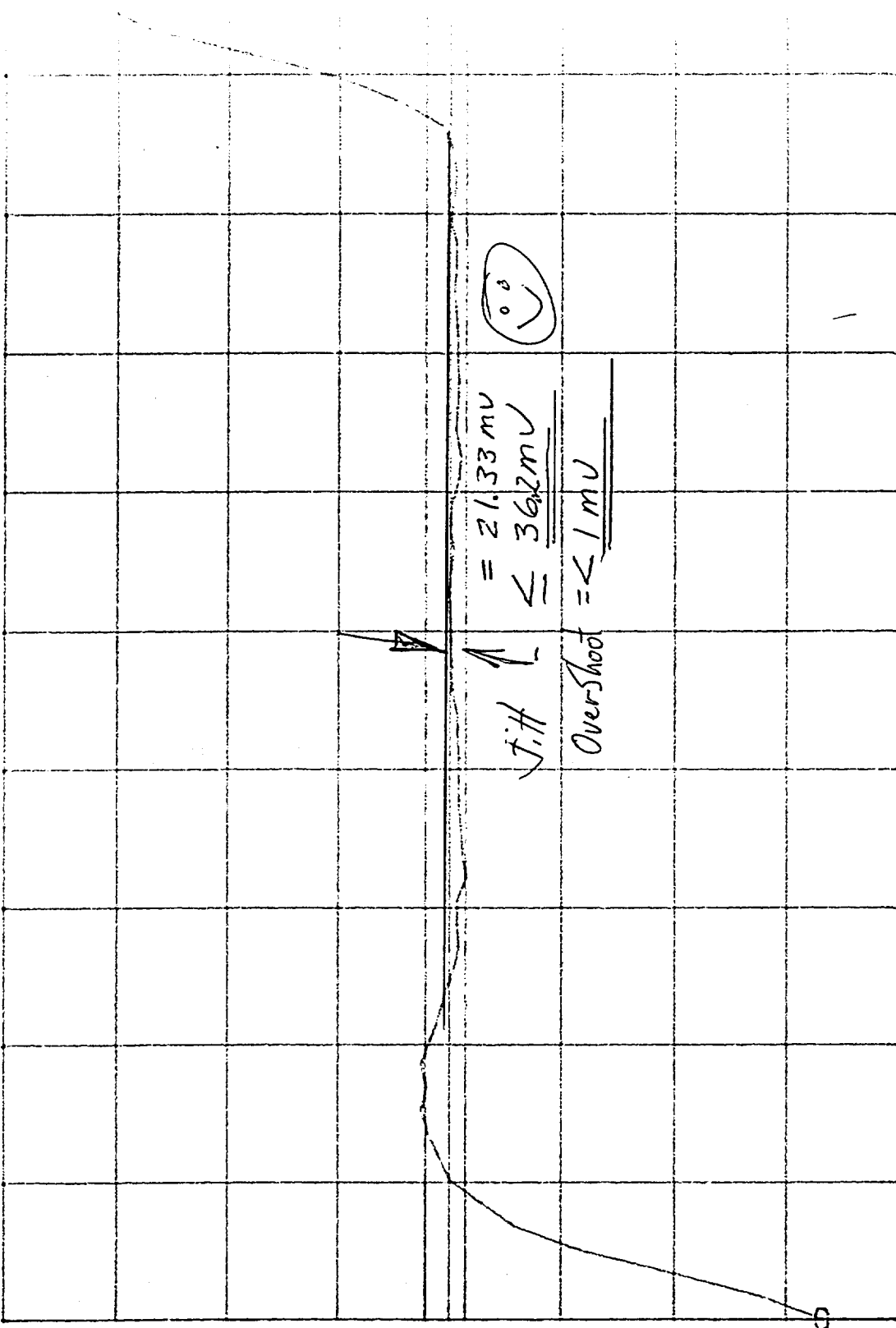
CAP TIM BUF

9.4

100

m

/DIV



Real

V

8.6

FXd X 187m Sec SCENE 2 7AP_FS51

S/O: 373249

3.4.5 A1-1

ANSU
U
SEIT

Test Eng:

Date: 8-18-98

PN: 1331720-2-17 SN: 106

Quality:

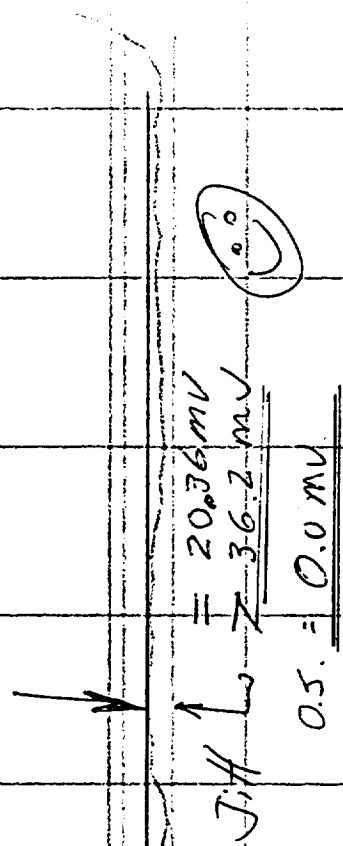
7A
268

AUG 19 1998

$X=382.8\text{ms}$ $\Delta X=222.7\text{ms}$ $Y=9.38873$ $\Delta Y=36.36\text{mV}$
 $Y_0=8.99788$ $\Delta Y_0=634.1\text{mV}$

CAP TIM BLUF
 9.7

100
 m
 /Div



Real

V

8.9

Exp X 800m 800 SCENE 3 7AP_F551

S/O: 373249

3.4.4.5 A1-1

Test Eng:

P/N: 1331720-2-17 SW: 106

Quality:

TA 268

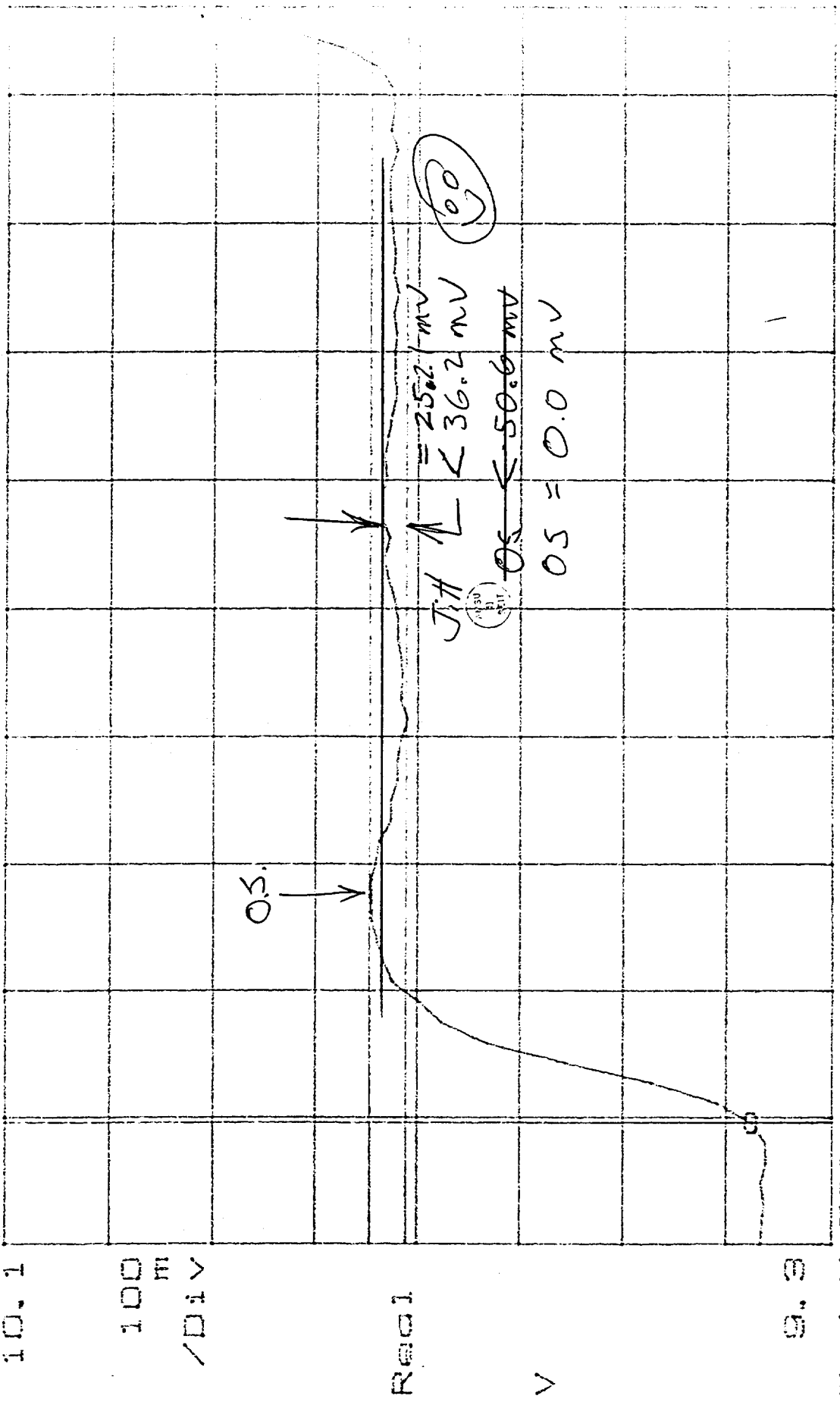
Date: 8-18-98

AUG 19 '98

X=589.8ms AX=214.8ms Y=9.71018 AY=35.30mV
 Y=9.37576 AY=540.1mV

CAP TIM BLUF
 10.1

100
 m
 /Div



EXD X 500m SEC SCENE 4 7AP_F551

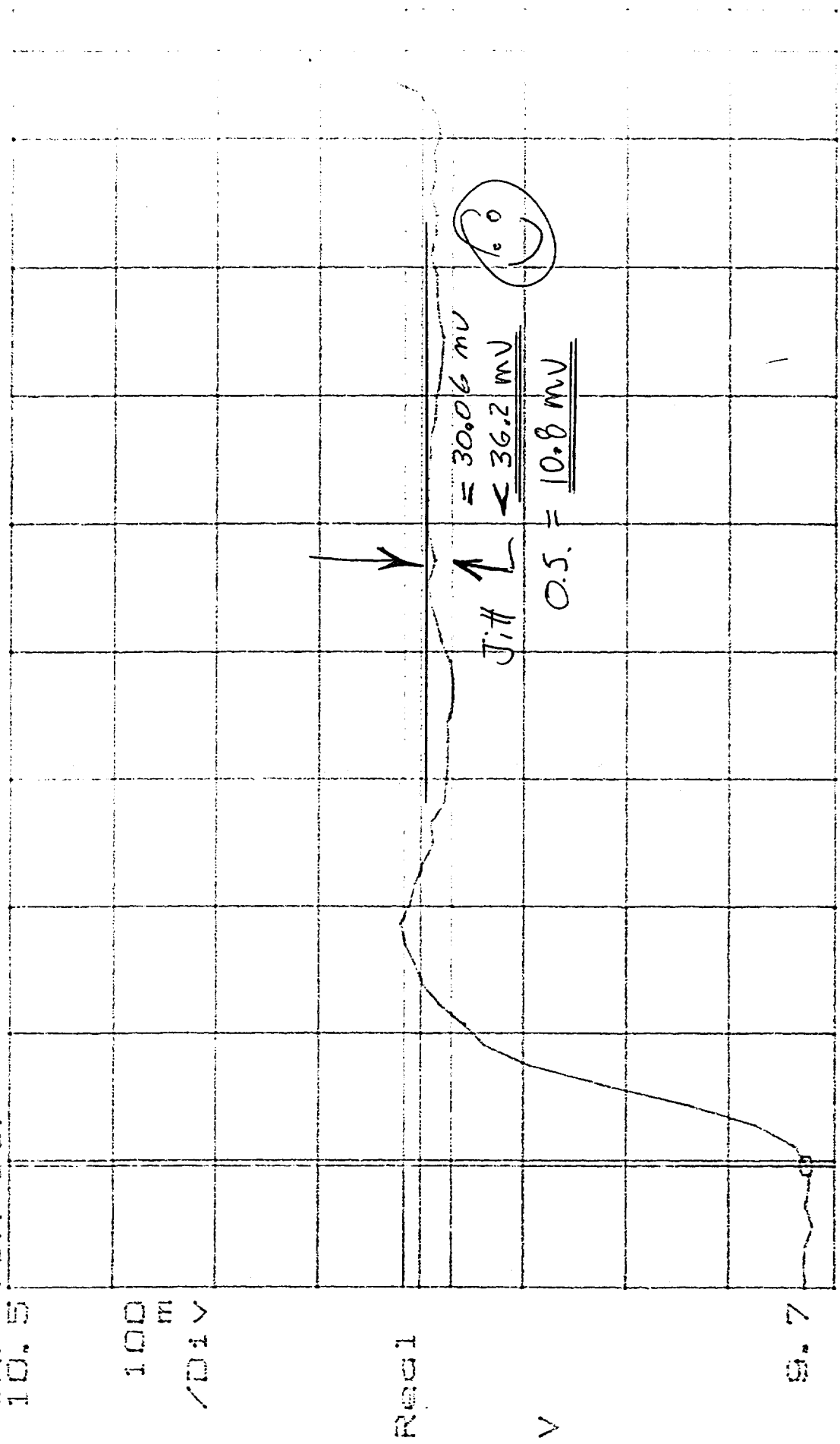
S/N: 373249 S/A: 5 A1-1 Test Eng: Date: 8-18-98

P/N: 1331720-2-II SW: 106

Quality: (7A 269)

106-18-98

X=789.1ms AX=214.8ms Y=10.0685 AY=47.03mV
 Yc=9.72608 AYa=486.5mV
 CAP TIM BUF
 10.5

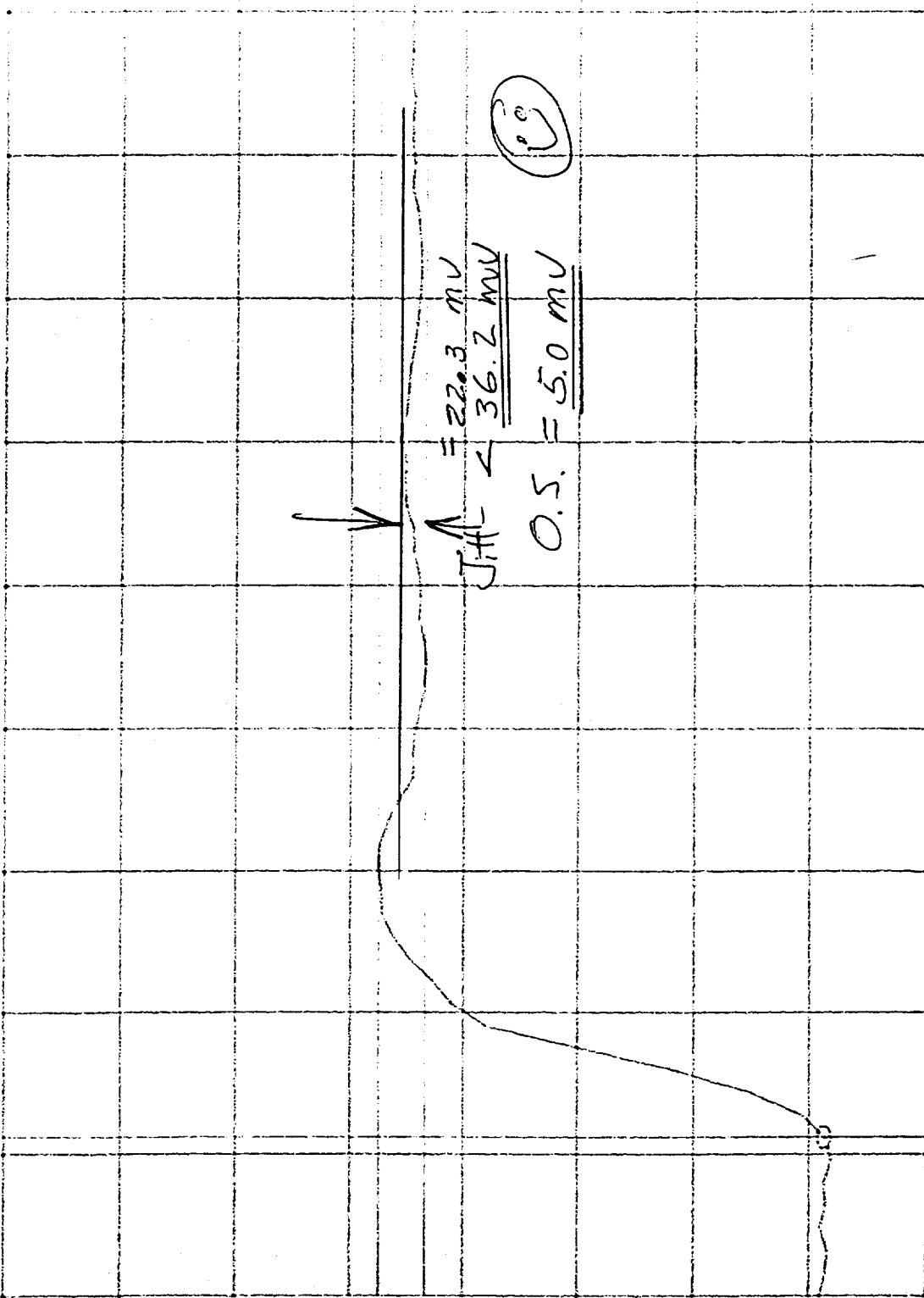


Exd X 700m Sec SCENE 5 7AP_F5E1
 S/N: 373249 3.4A.5 A1-1 Test Eng: Date: 8-18-98
 P/N: 1331720-2-17 SN: 106 Quality: TA 268
 AUG 19 '98

X=992.2ms AY=10.4325 Y=10.4325 ΔY=41.21mV
 YG=10.0861 ΔX=10.9ms ΔYG=428.2mV

CAP TIM BUF
 10.8

100
 H
 /DIV



Red1
 V

10.0

FXD X 005m SEC SCENE 6 7AP_F051

S/O: 373249
 P/N: 1331720-2-11 SN: 106
 3A.4.5 A1-1
 Test Eng:
 Quality:
 Date: 8-16-98
 7A 260 AUG 19 '98

X=1.195 S ΔX=214.8ms Y=10.8391 ΔY=40.73mV
Y=10.451 ΔY=501.1mV

CAP TIM BUF
11.1

100
m
/Div

Rec1

V

10.8

Fxd X 1.18

SEC SCENE 7

7AP_F551

S/O: 373249

3A.4.5 AI-1

Test Eng'

Date: 8-10-98

AN: 1331720-2-17 SW: 106

Qualify:

TA
268

AUG 19 98

X=1.308 S

Y=11.1853

AX=207.0ms

AY=31.03mV

Y=10.9176

AY=306.0mV

CAP TIM REF

11.4

100

m

/DIV

Real

V

10.6

Fxd X 1.30

SEC SCENE 8

7AP_F551

S/O: 373249

3.4.5 A1-1

Test Eng' (AP)

Date: 23-10-98

P/N: 1331720-2-17 SN: 106

Quality:

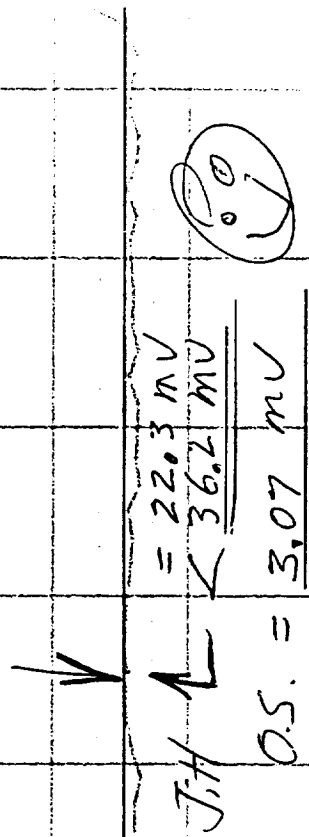
7A
260

AUG 19 98

X=1.602 S AX=214.8mS Y=11.5262 AY=39.27mV
 Yd=11.1825 AYd=527.1mV

CAP TIM BUF
 11.9

100
 m
 /DIV



Real

V

11.1

Fxd X 1.57 Sec SCENE 90 7AP_FSS1

S/O: 373249

3.4.4.5 AI-1

Test Eng: Date: 8/8/98

P/W: 1331720-2-17 SN: 106

Qualitr

TA 268

AUG 19 98

X=1.805 S AX=210.0mV Y=11.8845 ΔY=41.7mV
 YG=11.5458 ΔYG=442.8mV

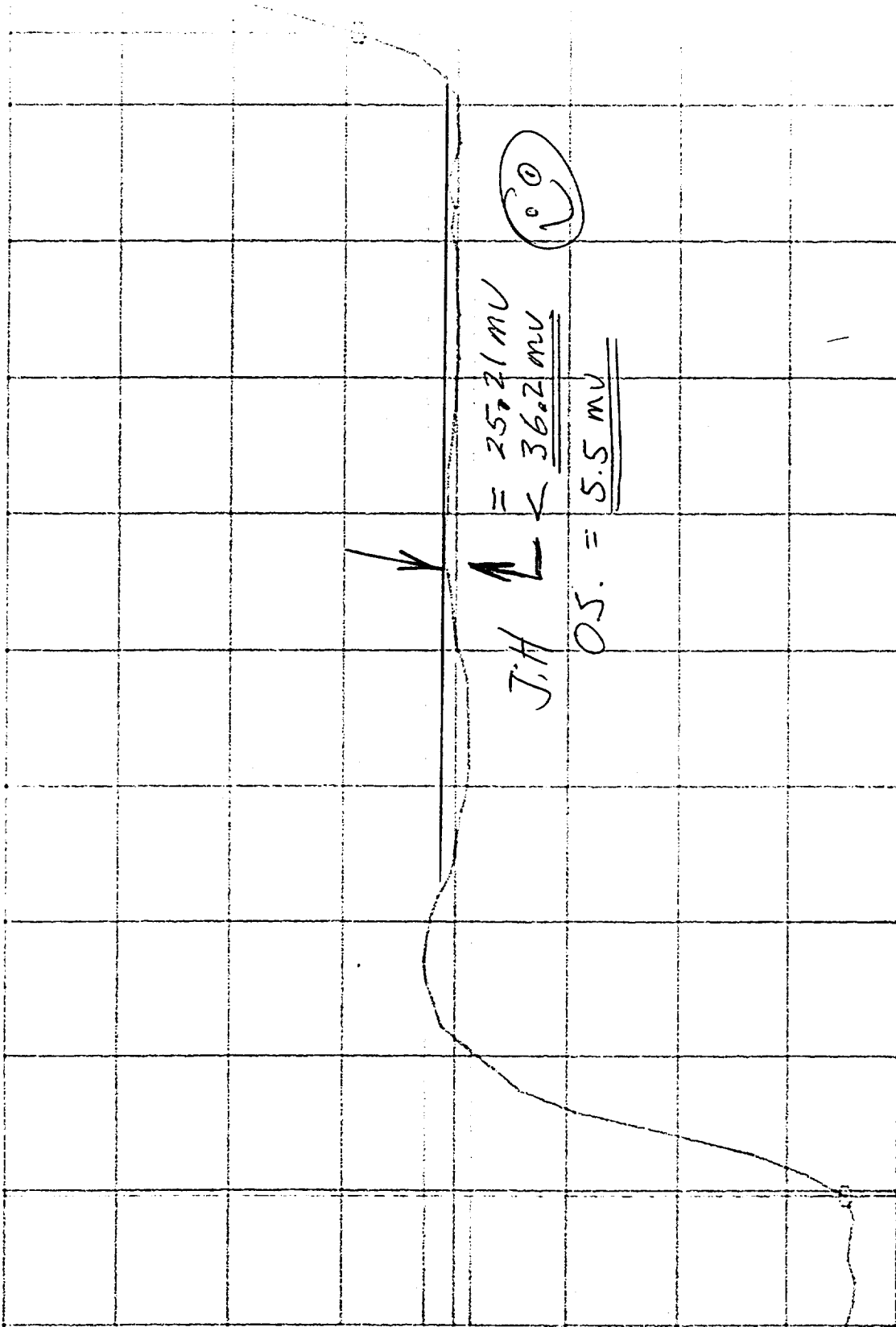
CAP TIM BUF
 12.3

100
 m
 /Div

Real

V

11.5



Fxd X 1.78 SEC SCENE 10 7AP_FSS1

Slo: 373249

3A.A.5 A1-1

Test Eng

Date: 8-10-90

P/N: 1331720-2-17 SN: 106

Quality: 7A 268

AUG 19 90

X=2.000 S AX=214.8mS Y=12.2887 AY=38.3mV
Y=11.9107 AY=530.3mV

CAP TIM BUF
12.0

100
m
/Div

Rec1

V

11.8

Fxd X 1.000 Sec SCENE 117 7AP_F051

56: 373249

344.5 A1-1

PN: 1331720-2-IT SN: 106

Test Eng:

Quality:

ANSU
0
REIT

TA
268

Date: 8-18-98

AUG 19 98

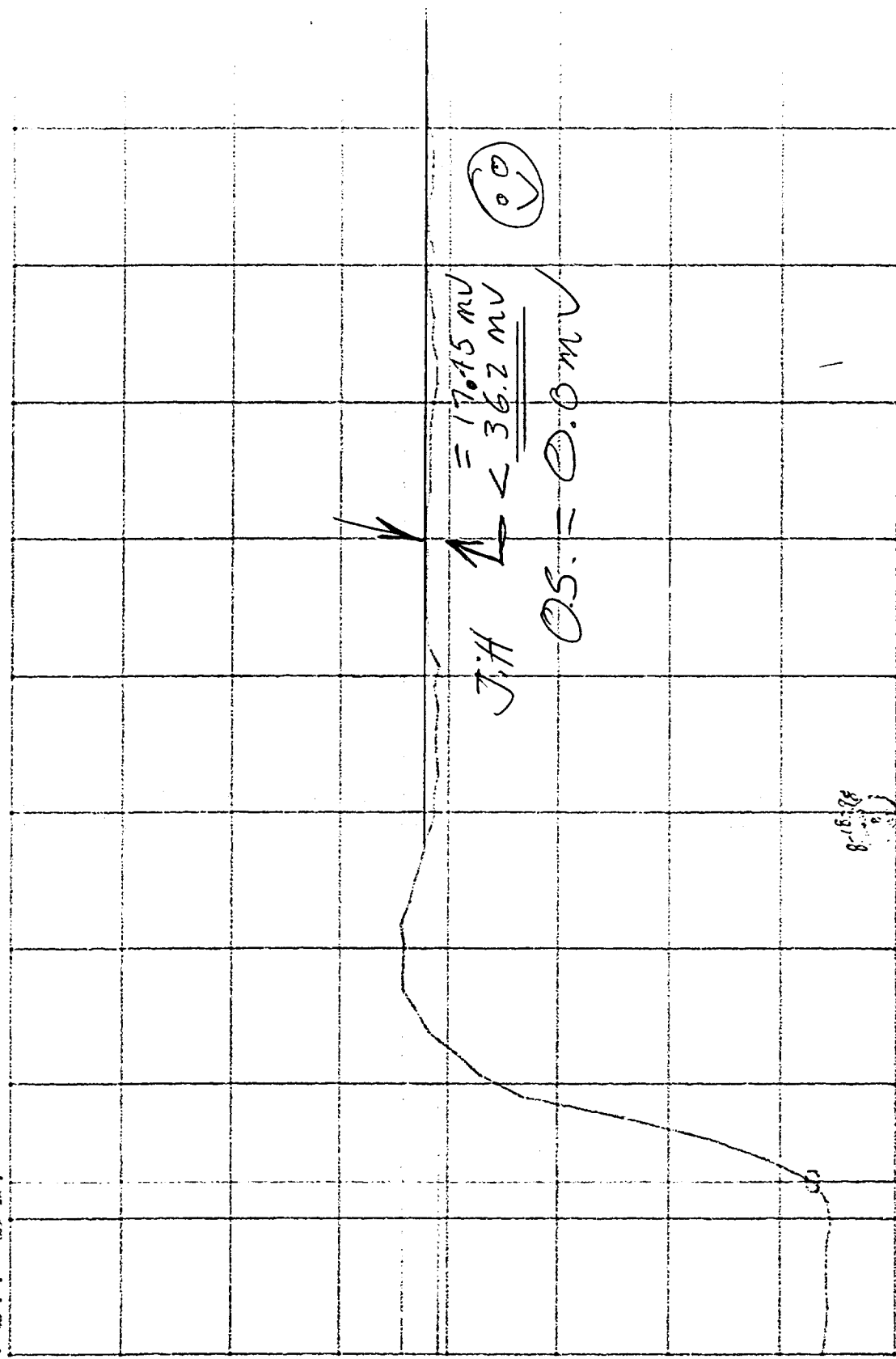
X: 211.5 AX: 010.9mV AY: 34.40mV
 Y: 12.2707 AY: 460.6mV

CAP TIM BUF
 13.0

100
 F
 /DIV

Regl
 V

12.2



FXD X 2.18 SEC SCENE 13 12 7AP F351

Date: 8-18-18

Test Eng:

3.7.4.5 A1-1

106 19 '98

7A
 268

Quality:

S/O: 373249

P/N: 1331720-2-1T SN: 106

XSEC: 41-5 AX: 011.4, 9001 AY: 001.0000
YSEC: 12.0100 AY: 011.0000

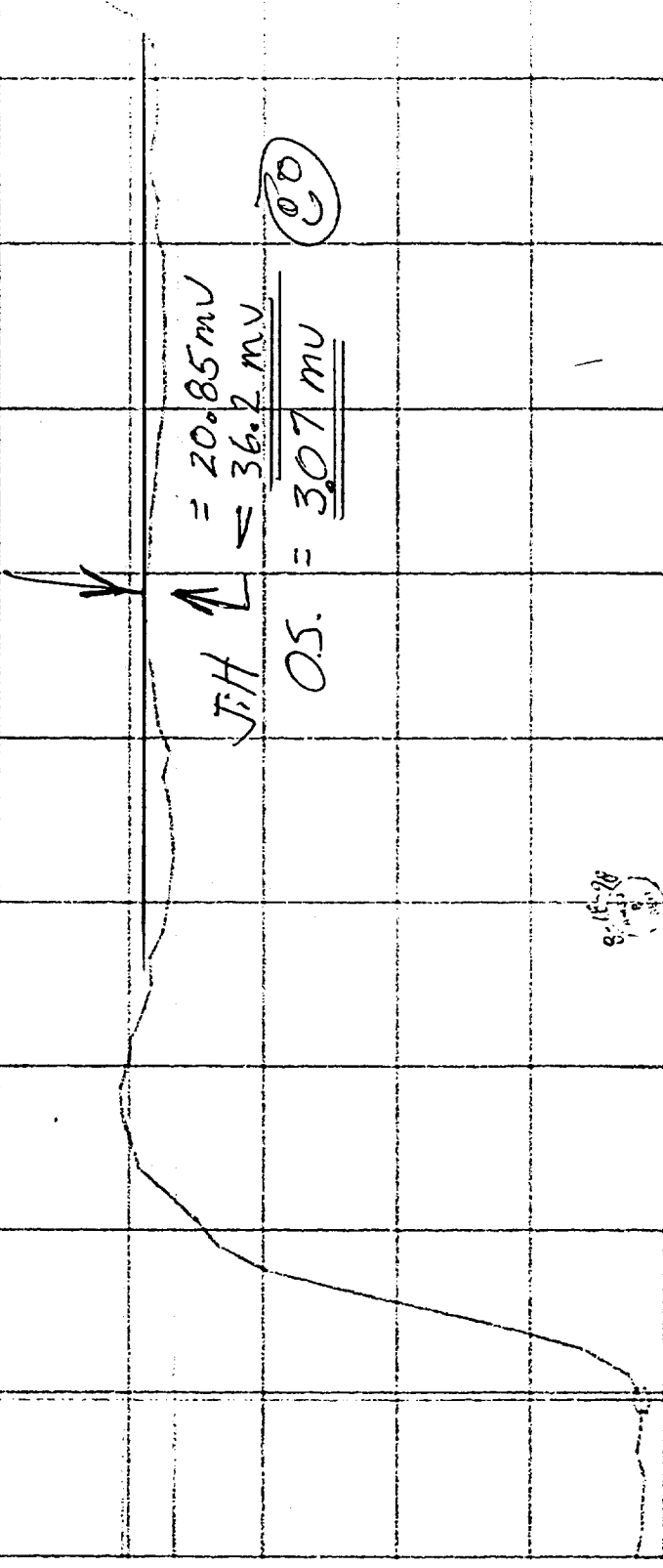
CAP TIM BLUE
13.4

100
V
/DIV

Real

V

12.0



Fxd X 2.30 Sec SCENE 1413 7AP_F551

S/O: 373249

3.4.4.5 A1-1

Test Eng:

Date: 8-18-98

P/N: 1331720-2-11 SN: 106

Quality:

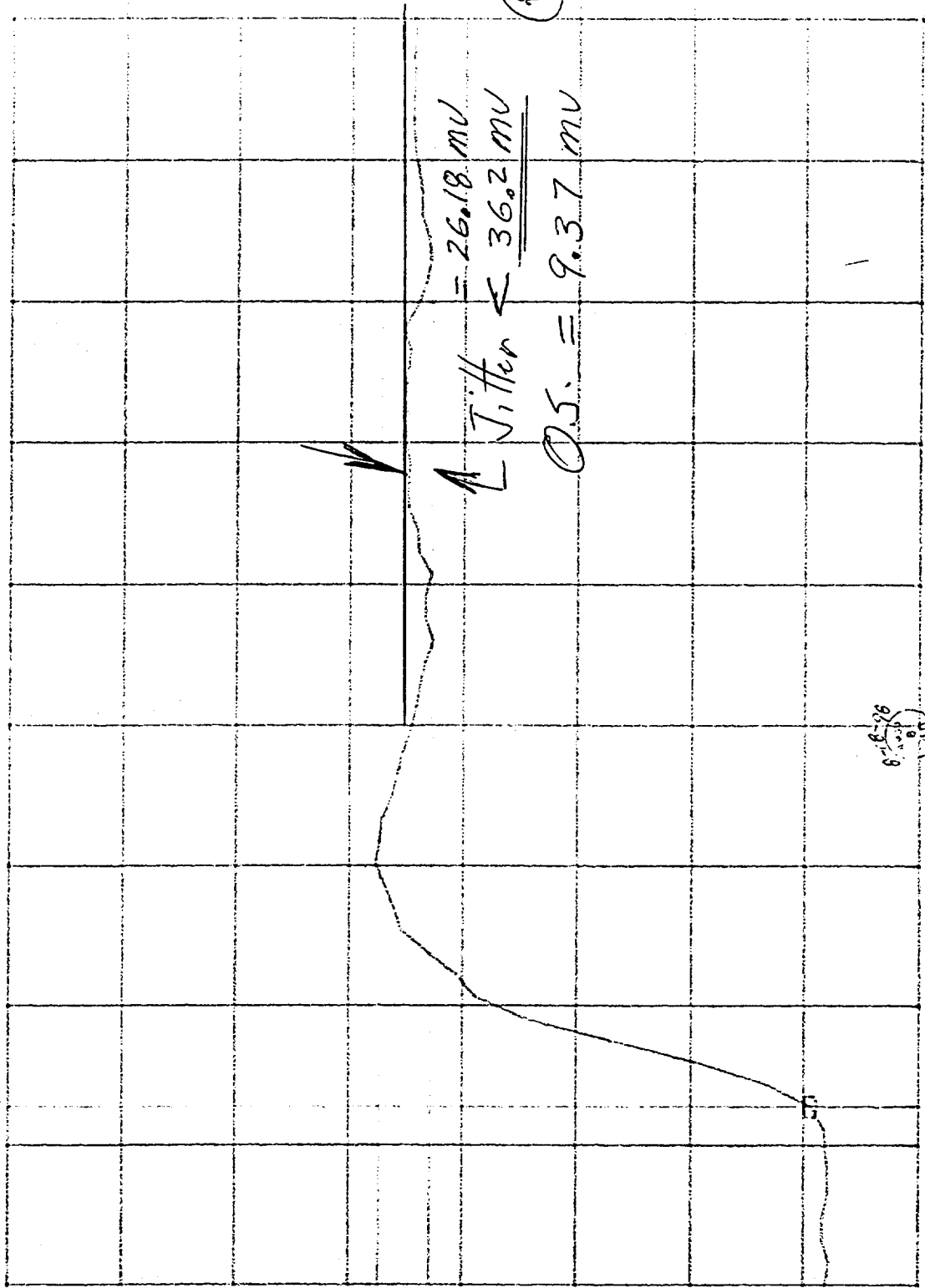
7A
268

AUG 19 90

X=2.617 S AX=207.0mV Y=19.3737 AY=45.0mV
 Y0=12.9041 AY0=407.1mV

CAP TIM BUF
 13.7

100
 V
 /DIV



Recd
 V

12.0

EXD X 2.50 500 SCENE 15 14 7AP-F051

S/O: 373249 3.4.4.5 A1-1 Test Eng: Date: 8-18-98
 P/W: 1331720-2-17 SN: 106 Quality: 7A 268 AUG 19 98

X=2.010 S AX=214.8mV Y=19.7335 AY=35.50mV
Y=19.73476 AY=499.0mV

CAP TIM BUF
14.1

100
m
/Div

Real

V

13.8

Fxd X 2.01

Geo

SCENE

16157AP_F551

S/O: 373249

3A45 A1-1

Test Eng

Date: 8-10-98

P/N: 1331720-2-1T SN: 106

Quality: 24
288

MS 10 98

BIC

X=3.02 S

Y=13.7044

AX=210.9ms

AY=40.78mV

CAP TIM BUF

14.4

100

m

/DIV

Real

V

13.0

FXD X 2.00

500

SCENE

AT 16

7AP_F051

ANSU
B
SETI

7A
268

Test Eng:

Quality:

S/O: 373249

P/N: 1331720-2-17 SN: 106

3.44.5 A1-1

Date: 8-10-98

AUG 19 '98

817

X=3.223 S ΔX=214.8mS Y=14.464 ΔY=41.7mV
Y=14.0661 ΔY=519.0mV

CAP TIM BUJF
14.8

100
H
/DIV

Rec1

V

14.0

Fxd X 3.2

SEC SCENE 18 17 7AP_F551

S/O: 373249

3.4.4.5 AI-1

Test Eng.

ARGU
D
SET

Date: 8-18-18

PN: 1331720-2-17 SN: 106

ARGU
D
SET

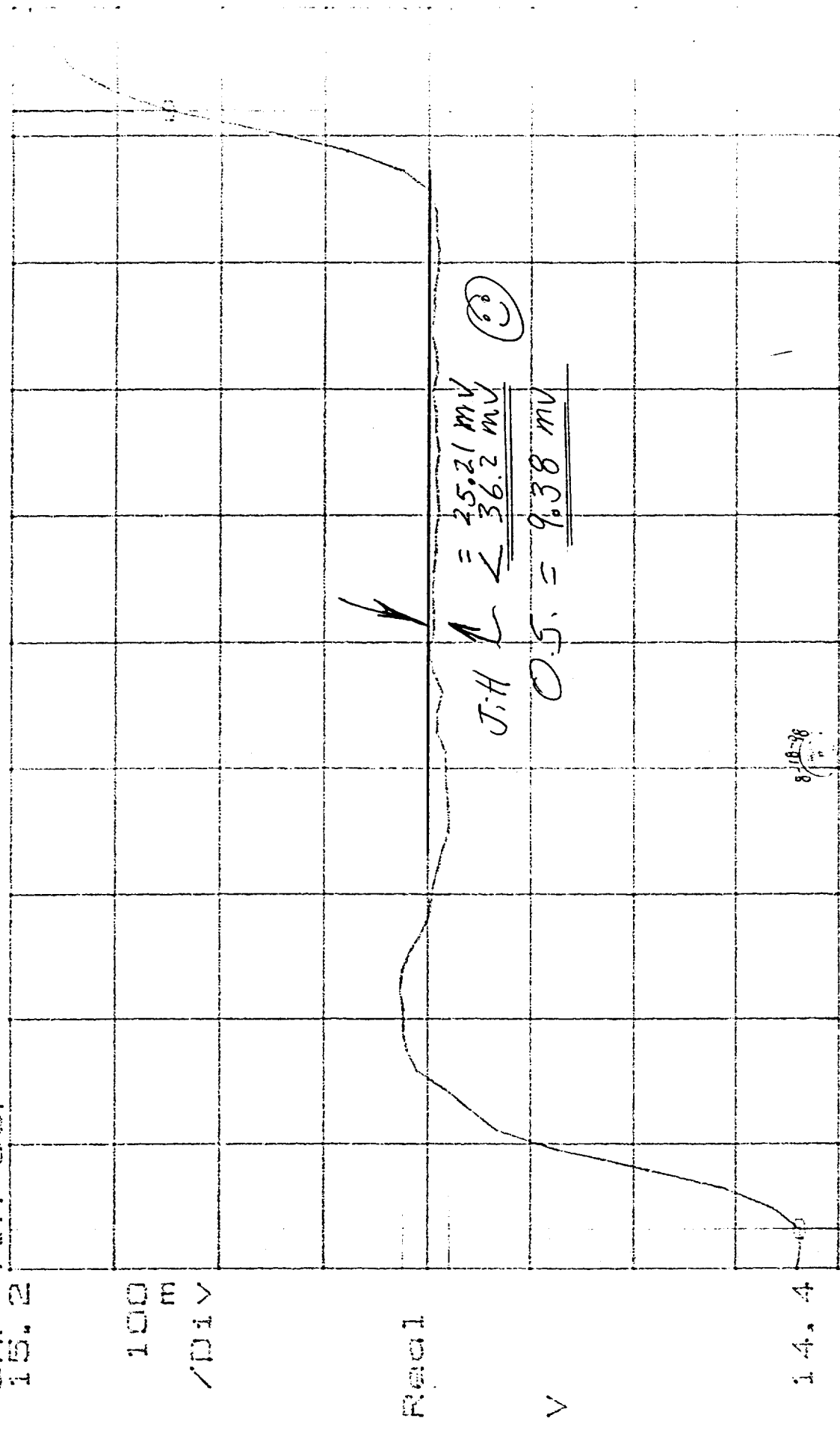
Quality

Aug 19 '98

X=3.426 S AX=C18.7mS AY=C18.1mV
 Y=14.4375

CAP TIM BUF
 15.2

100
 m
 /DIV



8/18/78

FXD X 3.42 SEC SCENE 1918 TAP_FSS1

S/O: 373249 Test Eqg: 3.4.45 A-1

P/N: 1331720-2-IT SW: 106

Quality: 24 268

Date: 8-18-78

AUG 18 '78

X=8,809.8 AX=210.0m Y=10.1011 AY=34.91m
Y=14.7091 AY=454.1m

CAP TIM BUF
15.5

100
m
/DIV

Rec1

V

14.7

Fxd X 3.0

Sec SCENE 2019 7AP_F551

S/O: 373249

3.4.5 AP-1

P/W: 1331720-2-17 SW: 106

Test Eng:

Quality:

ARGO
0
ST

24
288

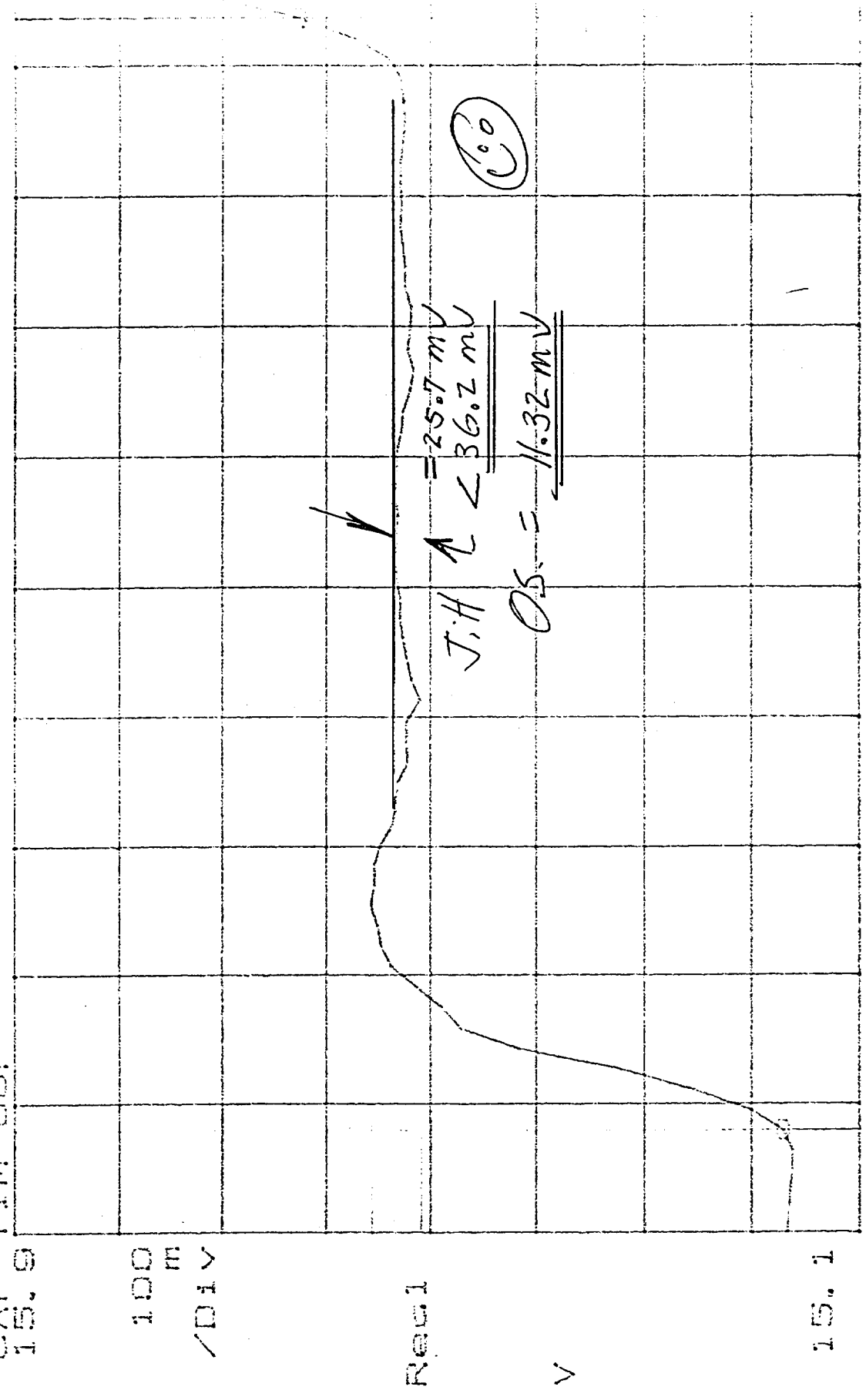
AUG 19 '98

Date: 8-18-98

X=3.880.8 AX=210.0mV AY=47.1mV
 Y=15.1705 AY=454.1mV

CAP TIM BUF
 15.9

100
 m
 /DIV



Fxd X 3.81 Scc SCENE 20 7AP F551 4.1
 3732.49 3.4.45 A1-1 Date: 8-18-98

SN: 1331720-2-17 SN: 106
 Test Eng: Quality: 24 26% AUG 19 '98

X=4.093 S AX=0.14.8mV
Y=15.9371 AY=0.48.1mV

0.11, 0.718

AY=0.14.8mV

CAP TIM BUF

10.3

100

m

/Div

Real

V

15.5

Fixd X 4.08

Sec

SCENE 22 21

7AP_F551

4.11

S/O: 373249

3.4.4.5 A1-1

Test Eng:

Date: 8-18-88

P/W: 1331720-2-17 SN: 106

27/88

Qualify:

AUG 19 1988

B22

XREF: 3.4.5 AX-0110.9mV AY-0110.9mV
YREF: 3.4.5 AY-0110.9mV AX-0110.9mV

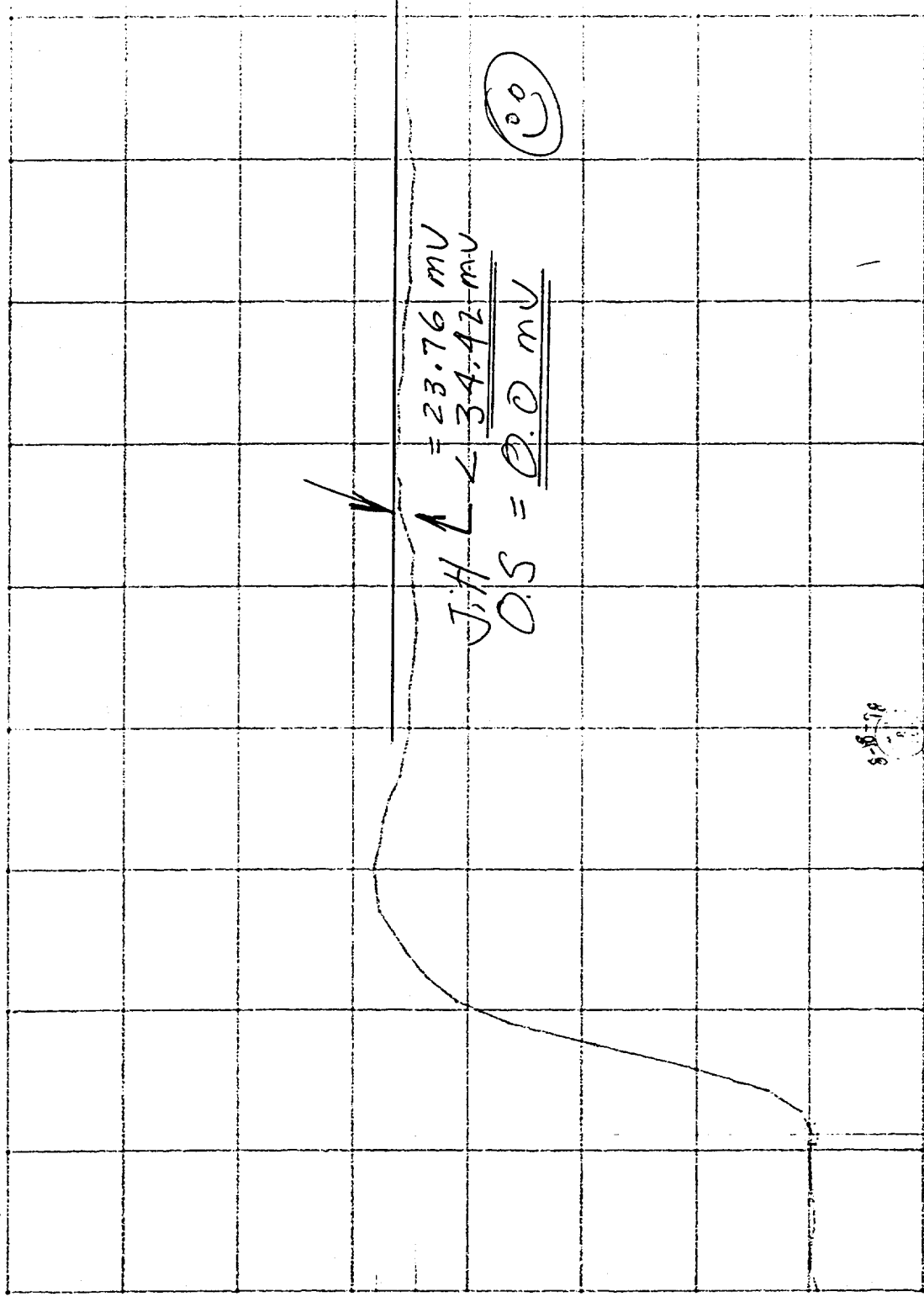
CAP TIM BUF
15.0

100
m
/DIV

Reg1

V

15.0



FXD X 4.21 SCENE 23 22 7AP F551

S/O: 373249

3.4.5 A1-1

Test Eng:

Date: 8-18-98

P/N: 1331720-2-IT SN: 106

Quality:

7A
268

Aug 19 98

X: 4.16, 2.0000
Y: 16.25000

AX: 4.16, 2.0000
AY: 16.25000

AX: 4.16, 2.0000
AY: 16.25000

AX: 4.16, 2.0000
AY: 16.25000

CAP TIM BUF
17.0

100
m
/Div

Real

V

16.2

Fxd X 4.41

Scn SCENE 23

TAP F551

S/O: 373249

3.4.4.5 A1-1

Test Eng:

Date: 8/18/98

P/W: 1331720-2-1T SW: 106

Quality (TA 258)

MAY 19 98

X: 4.041 S
Y: 18.16108

AX: 214.0 mV
AY: 40.0 mV

10.0 mV

AY: 41.0 mV

CAP TIM BUF
17.3

100
m
/DIV

Real

V

10.5

EXD X 4.01

Sec

SCENE 25

24

7AP_F551

S/O: 373249

3.44.5 A1-1

Test Eng: (1)

(1)

Date: 8-18-90

P/N: 1331720-2-IT SN: 106

Quality: (7A)

(258)

AUG 19 '90

B25

X: 1.000000 Y: 1.000000 AX: 0.100000 AY: 0.100000

CAP TIM BUF
17.7

100
m
/DIV

Real

V

10.0

Fxd X 4.92

SCENE 2625 TAP_F051

S/O: 373249

344.5 A1-1

Test Eng.:

Date: 8-18-98

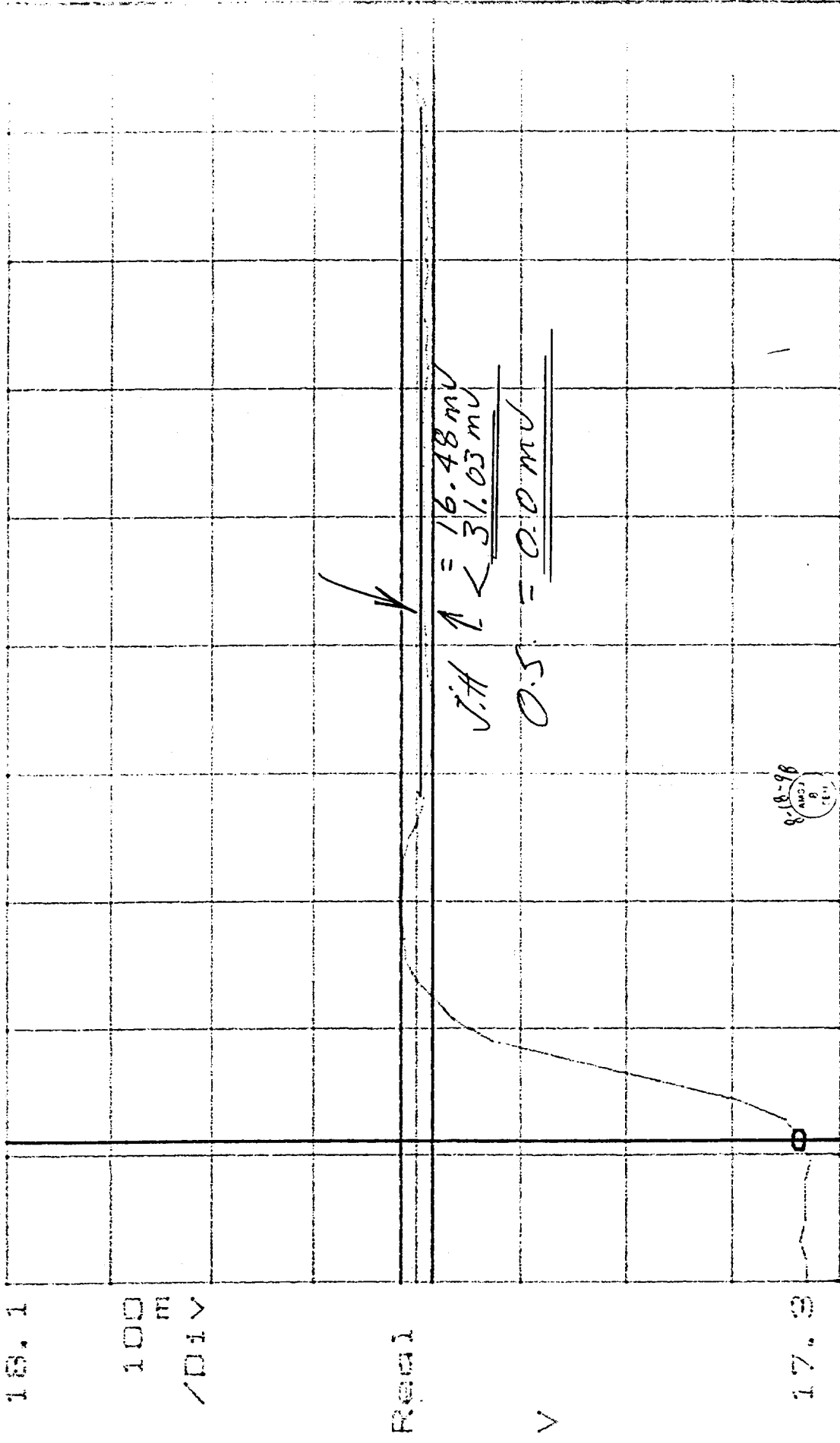
P/N: 1331720-2-IT SN: 106

Quality: TA 268

100 10 96

X=5.047 S ΔX=218.7ms Y=17.7145 ΔY=31.03mV
 YG=17.3373 ΔYg=590.3mV

CAP TIM BLIF



Exd X 5.02 SMO SCENE 27 26 7AP_F551

S/O: 373249

3.4.45 A1-1

Test Eng' (1)

Date: 8-18-98

P/W: 1331720-2-17 SN: 106

Quality:

TA 268

WFS 19 98

X=5.25 S ΔX=218.7ms Y=18.0697 ΔY=30.3mV
Yc=17.699 ΔYc=603.3mV

CAP TIM BUF
18.5

125
m
/DIV

Real

V

17.5

FXD X 5.25

SCENE 28 27 7AP_F551

3-4-45 A1-1

Test Eng'

Date: 8-18-98

S/O: 373249

P/N: 1331720-2-17 SW: 106

Quality:

AUG 19 '98

B28

X=5.453 S ΔX=214.8mS Y=18.4242 ΔY=29.58mV
 Y0=18.0558 ΔY0=514.1mV

CAP TIM BUF

18.8

100

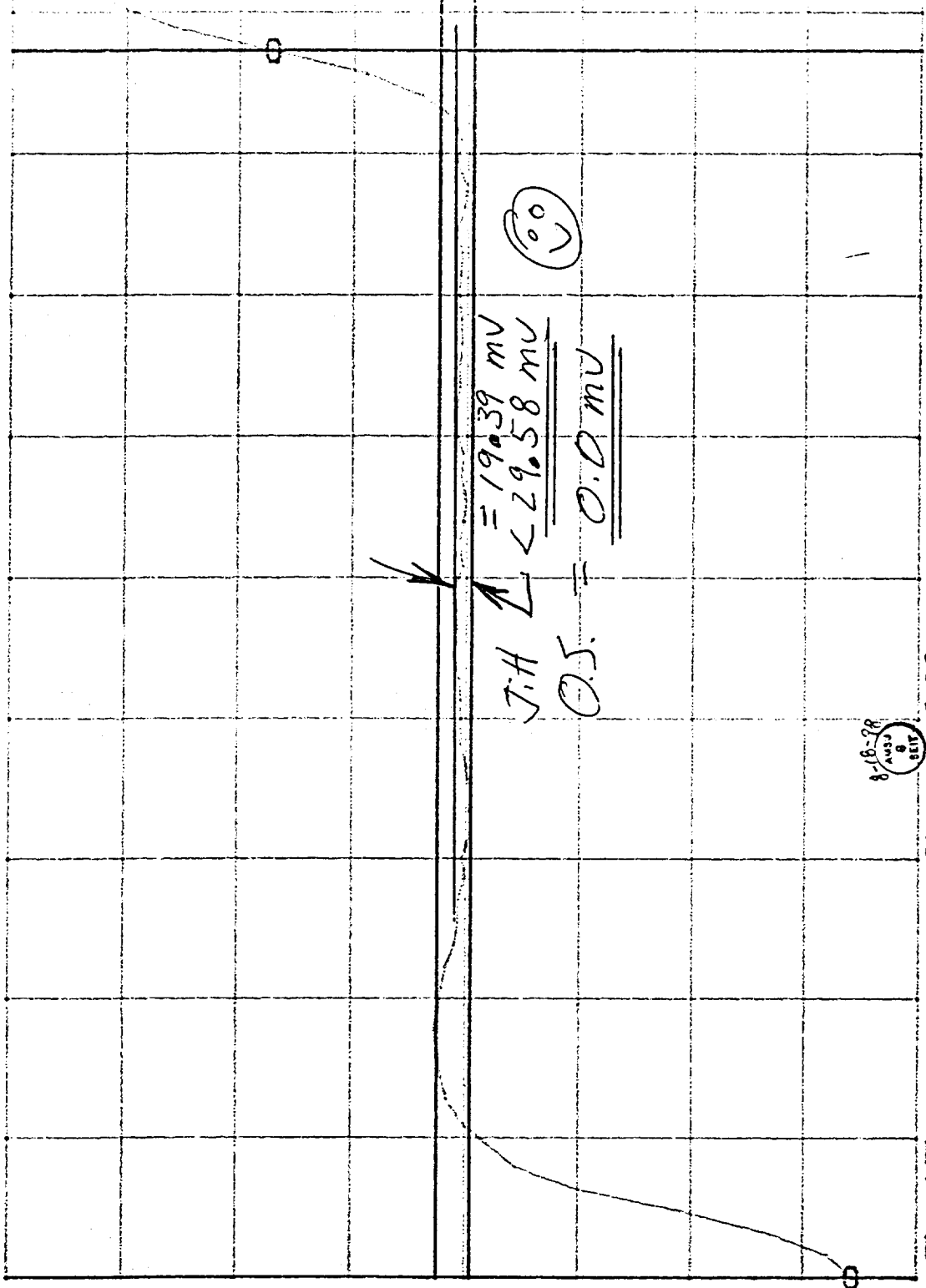
m

/Div

Reg1

V

18.0



Fxd X 5.45 SEC SCENE AT 28 7AP_FSD1

S/O: 373249

3.4.4.5 A1-1

Test Eng :

Date: 8-18-98

P/W: 1331720-2-17 SN: 106

Quality : TA 260

AUG 19 98

X=5.656 S ΔX=210.9ms Y=18.7879 ΔY=28.12mV
Y=18.4126 ΔY=454.1mV

CAP TIM BUF
19.2

100
m
/DIV

Rec1

V

19.4

Fxd X 5.03

SEC SCENE 30 29 7AP_F551

8-11-98

4400
B
SEIT

1

S/O: 373249

3.4.4.5 A1-1

Test Eng:

Date: 8-11-98

P/N: 1331720-2-17 SN: 106

Quality: 7A (268) AUG 19 98

X=5.855 S
Y=18.7645

$\Delta X = 210.9 \text{ ms}$
 $\Delta Y = 408.7 \text{ mV}$

Y=19.1585

$\Delta Y = 30.54 \text{ mV}$

CAP TIM BUF
16.4

100
mV
/DIV

Reg1

V

10.0

EXD X 5.02

500

SCENE 30

TAP_F551

S/O: 373249

3.445 A1-1

Test Eng:



Date: 8-1-98

P/N: 133/720-2-17 SN: 106

Quality: TA 060

AUG 10 '98

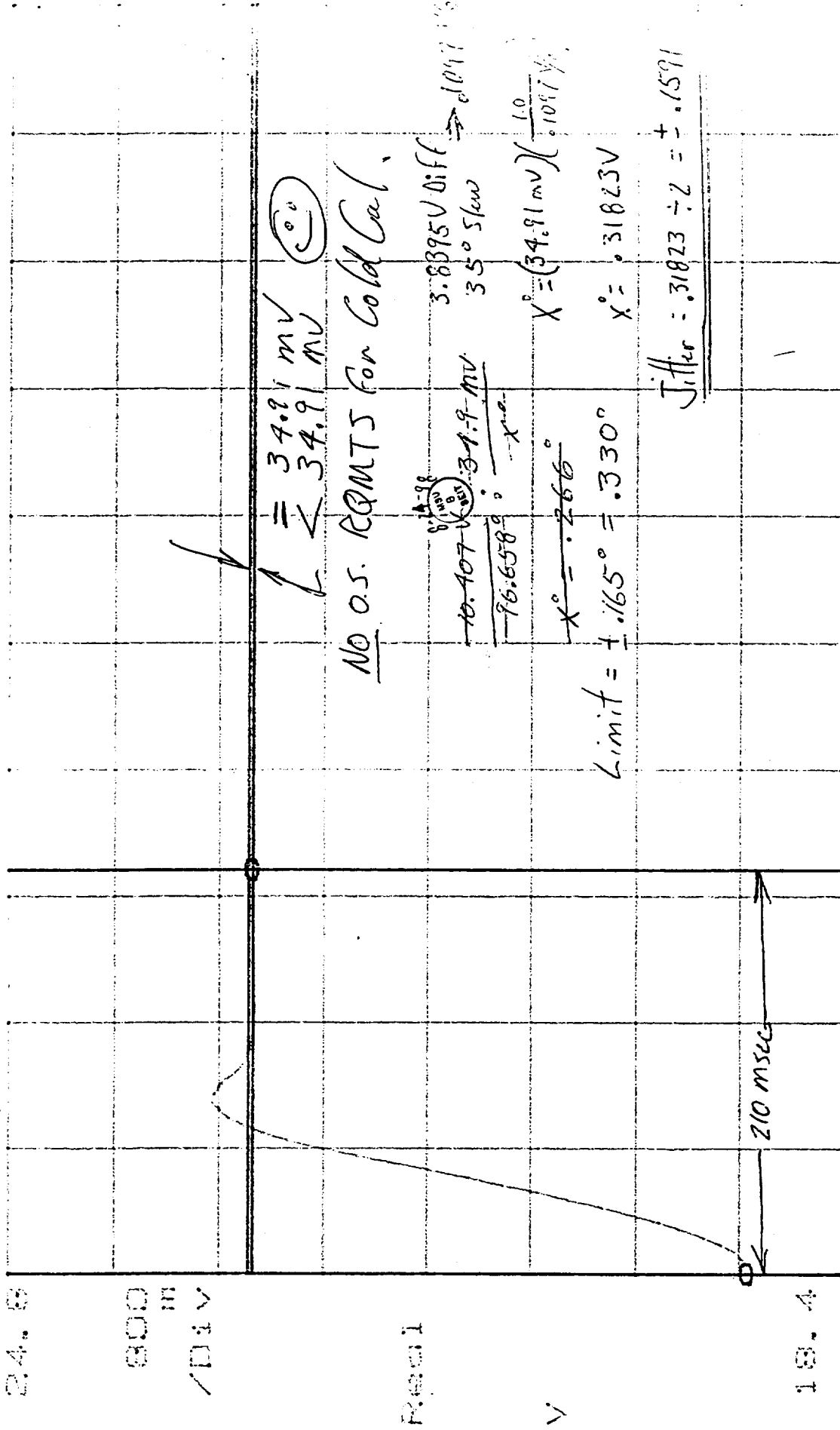
X=6.059 S
Y=19.1375

AX=210.9ms
AY=3.813 V

Y=22.977

ΔY=34.91mV

CAP TIM BUIF
24.8



7AP_F951

Sec COLD CAL

Fxd X 0.00

S/O: 373249

3.4.4.5 A1-1

Test Eng:

Date: 8-18-88

P/W: 1331720-2-17 SW: 106

Quality:

TA 259

AUG 19 1988

B32

X=6.684 S ΔX=402.3ms Y=33.5103 ΔY=29.09mV
 Yc=23.0056 ΔYc=10.54 V

CAP TIM BUF
 38.0

2.0

/Div

Real

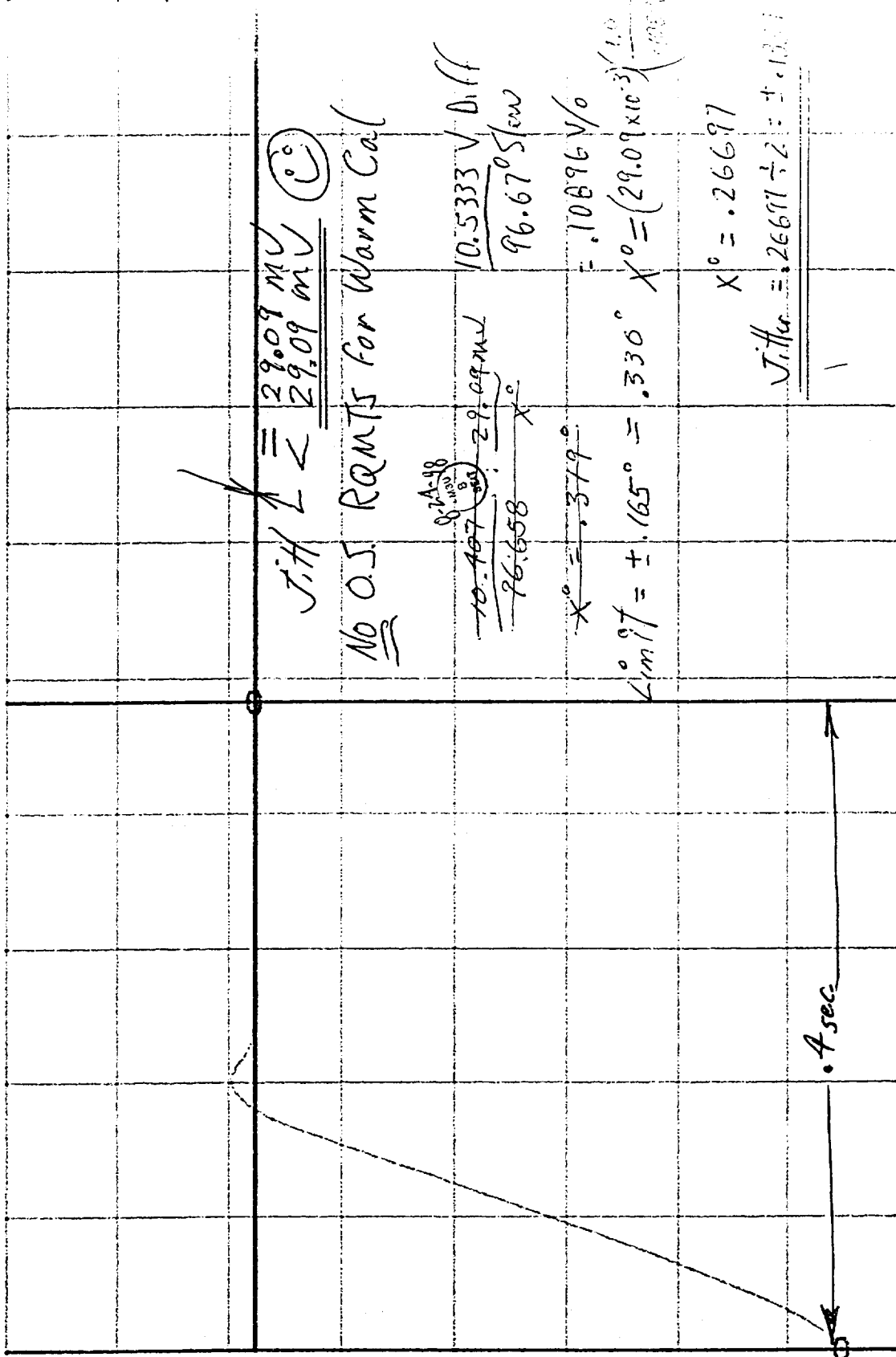
V

22.0

Exd X 0.00

0.00 WARM CAL

7AP_F551



S/O: 373249

3.4.4.5 A1-1

Test Eng:

Date: 8-10-18

P/N: 1331720-2-17 SW: 106

Quality

2A 268

2A 268

X=136.72mSec
Y=3.36853 V

CAP TIM BLIP
50.0

$$\text{Diff} = 10.407 \text{ V} \div 96.658^\circ = 107.67 \% \times .033333^\circ = 3.589 \text{ mV/18}$$

$$\text{Jitter} = 5 \times 3.589 = 17.94 \text{ mV/520}$$

$$\pm 5\% = 2 \times 17.94 = 35.89 \text{ mV Jitter Range}$$

Allowed Over Shoot (0.5.)

$$4 \times 35.89 = 14.356 \text{ mV Over Shoot limit.}$$

Recal

V

$$\text{BP \#1} = 3.3685 \text{ Volts}$$

$$\text{BP \#30} = 13.7758 \text{ V}$$

INDEXY 0.0 500

44AP F.S.F.

3.4A.5 A1-2

Test Eng.

Date: 8-18-77

S/O: 373249

Qualitr

24
268

AUG 19 1977

634

X=7.812mS
Y=3.36042

$\Delta X=191.4mS$
 $\Delta Y=300.0mV$

Y=3.35127

$\Delta Y=25.92mV$

CAP TIM BLIF

4.3

191

m

/DIV

Real

V

2.77

FX:XY 7.81m

SCENE 1

44AP FEB

S/O: 373249

3.4.5 A1-Z

Test Eng:

Date: 8-18-78

P/N: 1331720-2-IT SN: 106

Quality: TA 258

AUG 19 78

X=187.5ms
Y=3.41881

ΔX=210.9ms
ΔY=522.2mV

Y=3.7137
ΔY=38.79mV

CAP TIM BUF
4.2

100
mV

Rec'd

V

3.40

Exp'd X 187m

SCENE 2

44AP FSS

S/O: 373249

3.4.4.5 A1-2

Test Eng'

Date: 8-19-98

P/N: 133/720-2-17 SN: 106

Quality:

TA
260

AUG 19 '98

X=386.7ms ΔX=214.8ms Y=4.10339 ΔY=29.58mV
Y=3.73344 ΔY=580.6mV

CAP TIM BUF

4.5

100

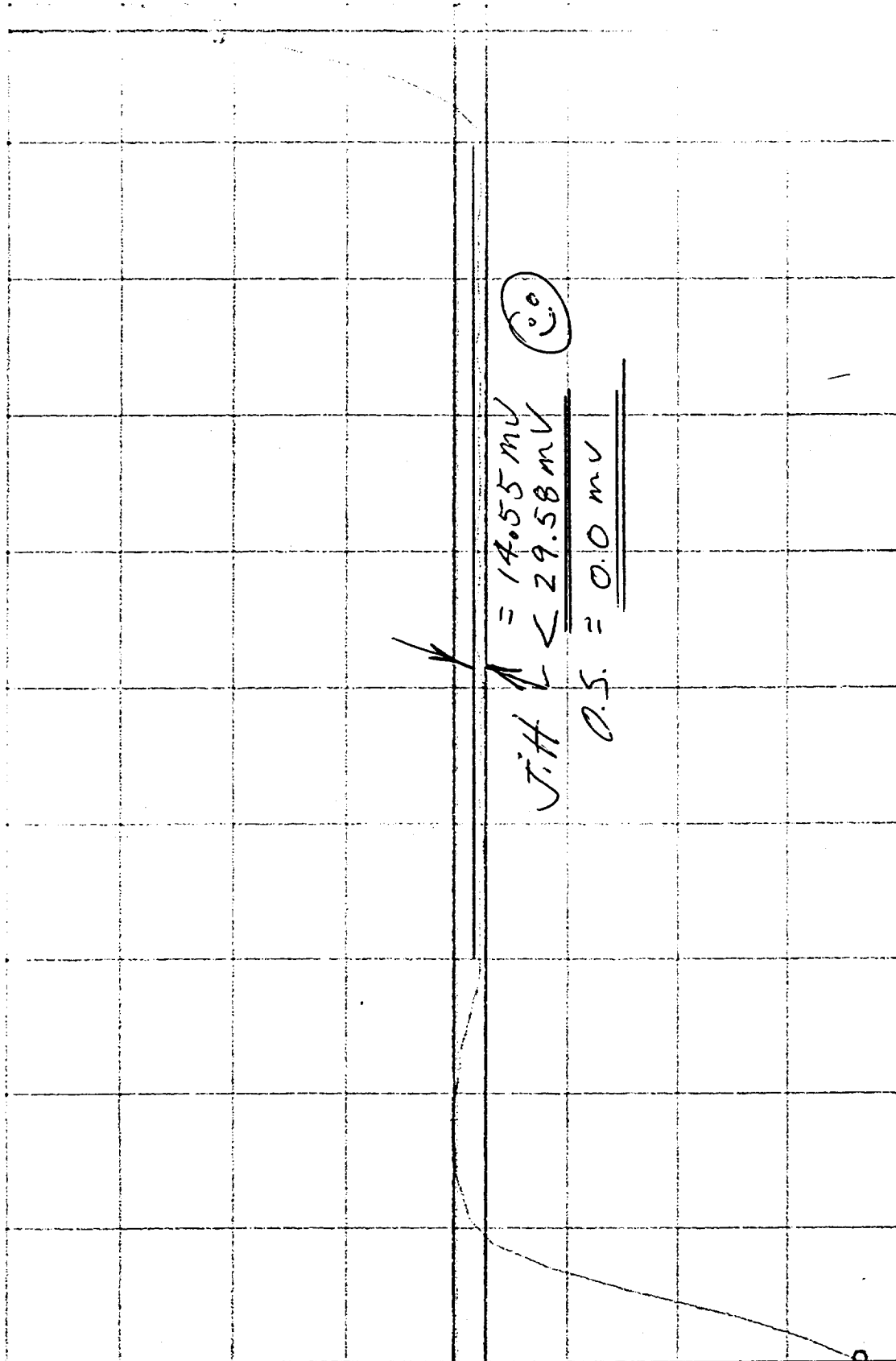
m

/DIV

Rec'd

V

3.70



Fxd X 987m SGO SCENE 3 44AP_FSS

S/O: 373249

3.4.4.5 A1-2

Test Eng.

AMSU
B
SEIT

Date: 10-18-98

P/N: 1331720-2-IT SN: 106

1A
260

MIS 19 '98

Quality

X=585.9ms ΔX=214.8ms Y=4.464 ΔY=32.49mV
Yc=4.08213 ΔYc=523.8mV

CAP TIM BLP

4.0

100

m

/DIV

Rect1

V

4.0

Fxd X 580m

SCENE 4

44AP F05

S/O: 373249

3A15. A12

Test Eng.

Date: 8-18-98

P/W: 1331720-2-1T SN: 106

Quality:

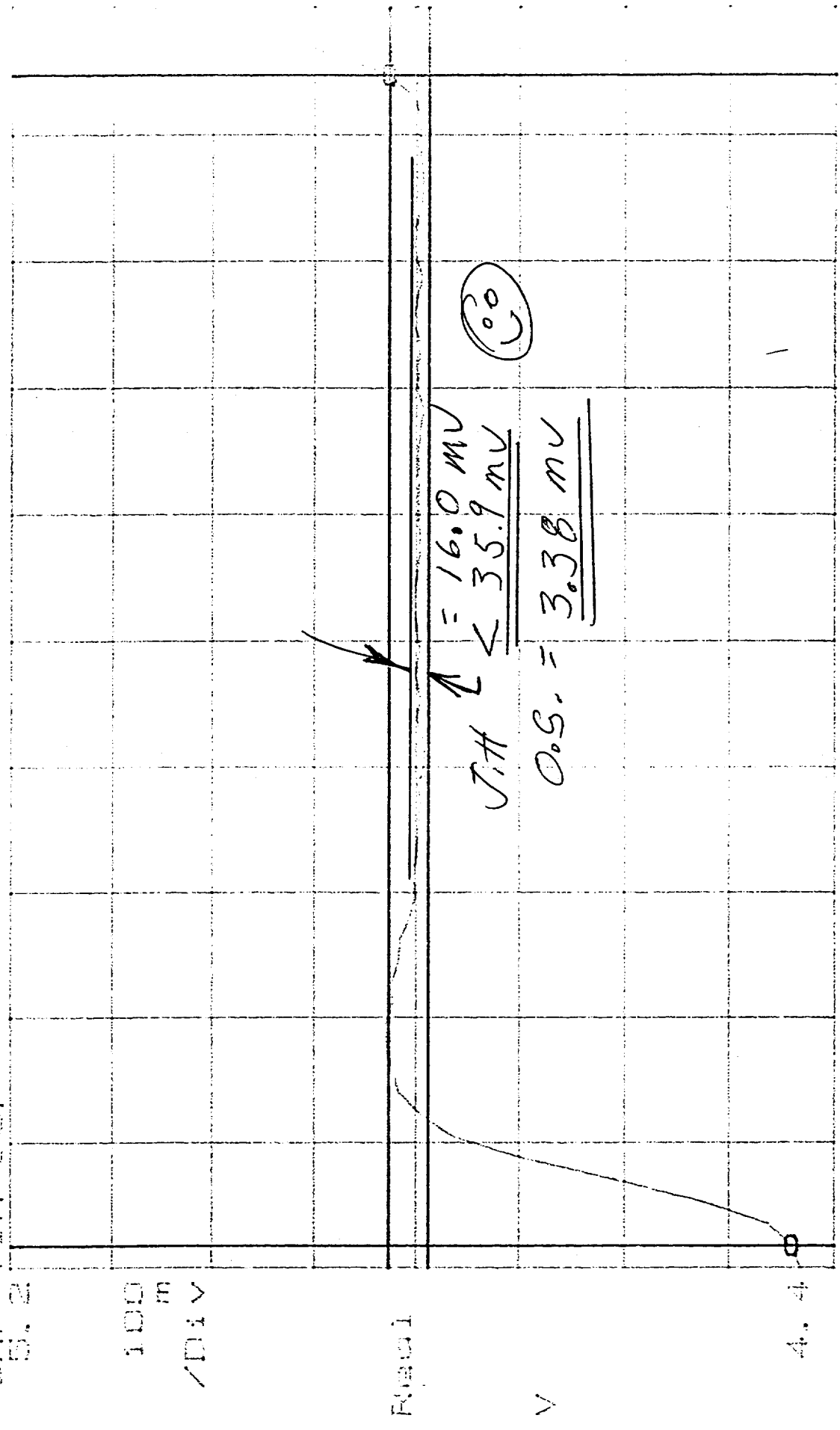
178

AVG 18 98

B38

$X=789.1\text{ms}$ $\Delta X=207.0\text{ms}$ $Y=4.82666$ $\Delta Y=39.27\text{mV}$
 $Y_a=4.44055$ $\Delta Y_a=386.0\text{mV}$

CAP TIM BUF



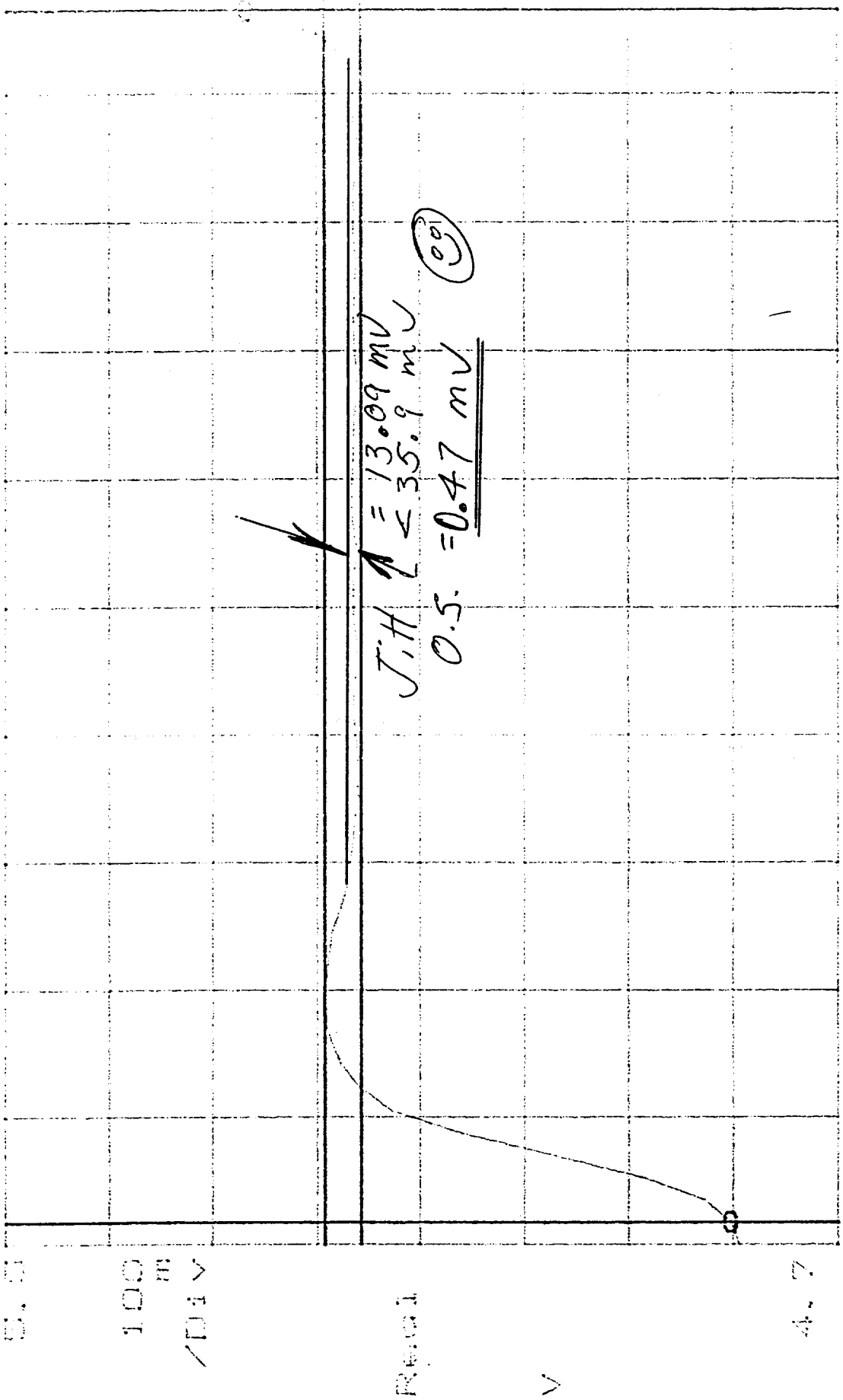
Fwd X 789m 520 SCENE 5 44AP F-55 Date: 8-18-98
 S/o: 373249 3.44.5 A1-2 Test Eng: Quality:

P/W: 1331720-2-17 SN: 106

X=992.2ms ΔX=210.9ms Y=5.19261 ΔY=36.36mV
 Ya=4.80222 ΔYa=465.5mV

CAP TIM BDP
 0.5

100
 mV
 /DIV



Reg 1

V

4.7

Expd X 998m Sec SCENE 6 44AP FOR

ANSU
 8
 SEIT

S/O: 373249

3.A.5 A1-2

Test Eng.

Date: 8-18-98

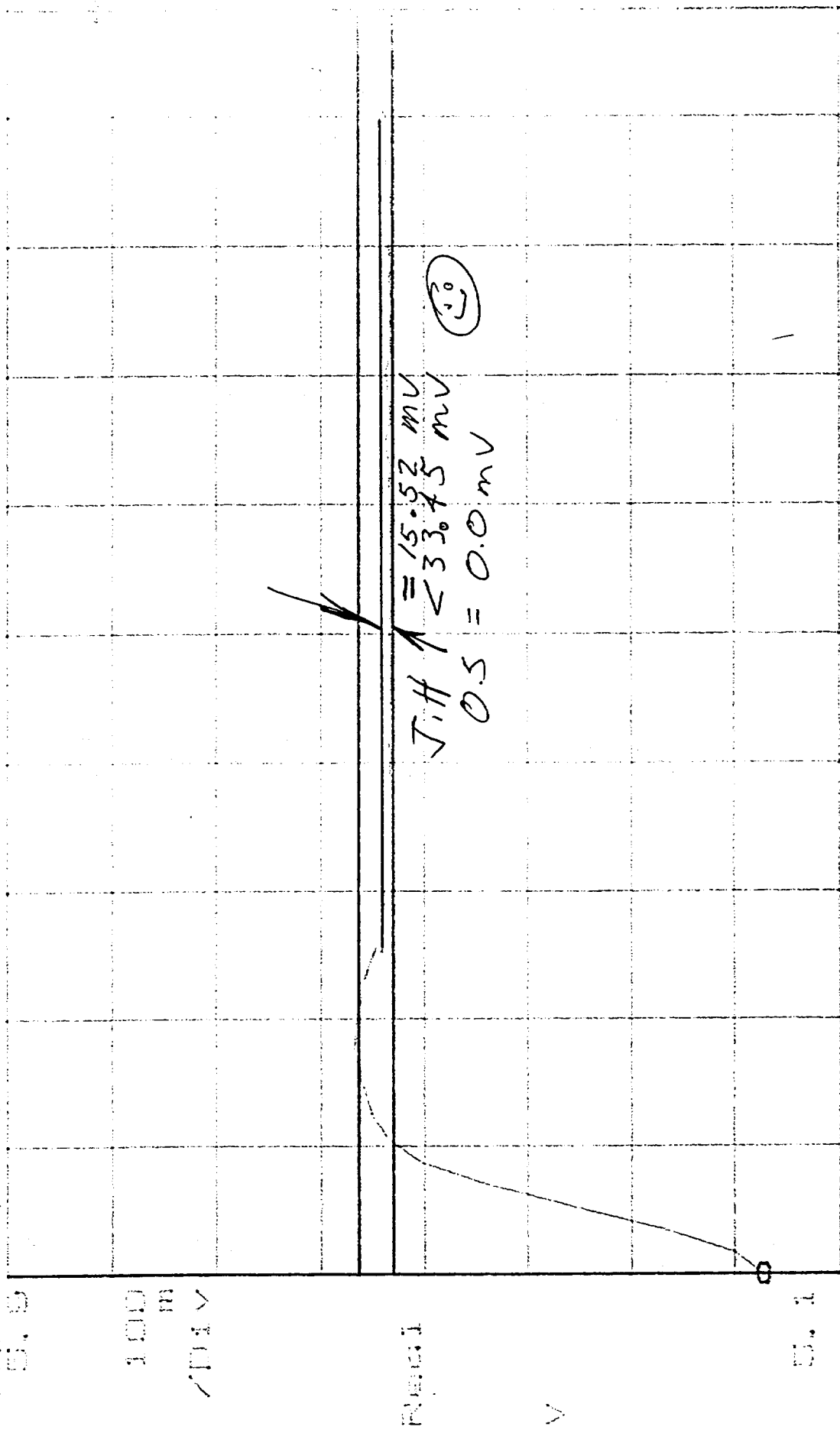
P/N: 1331720-2-1T SN: 106

Quality: 1A 269

AUG 19 98

$X=1.195\text{ S}$ $\Delta X=218.7\text{ mS}$ $Y=5.56351$ $\Delta Y=33.45\text{ mV}$
 $Y_a=5.172$ $\Delta Y_a=645.5\text{ mV}$

CAP. TIM. SUP.
 5.0



EX: D: X 1.0 0.00 SCENE 7 4.4 AP 1.00

AMJ 0 SET

Test Eng: Date: 8-18-98

1P 29

Quality:

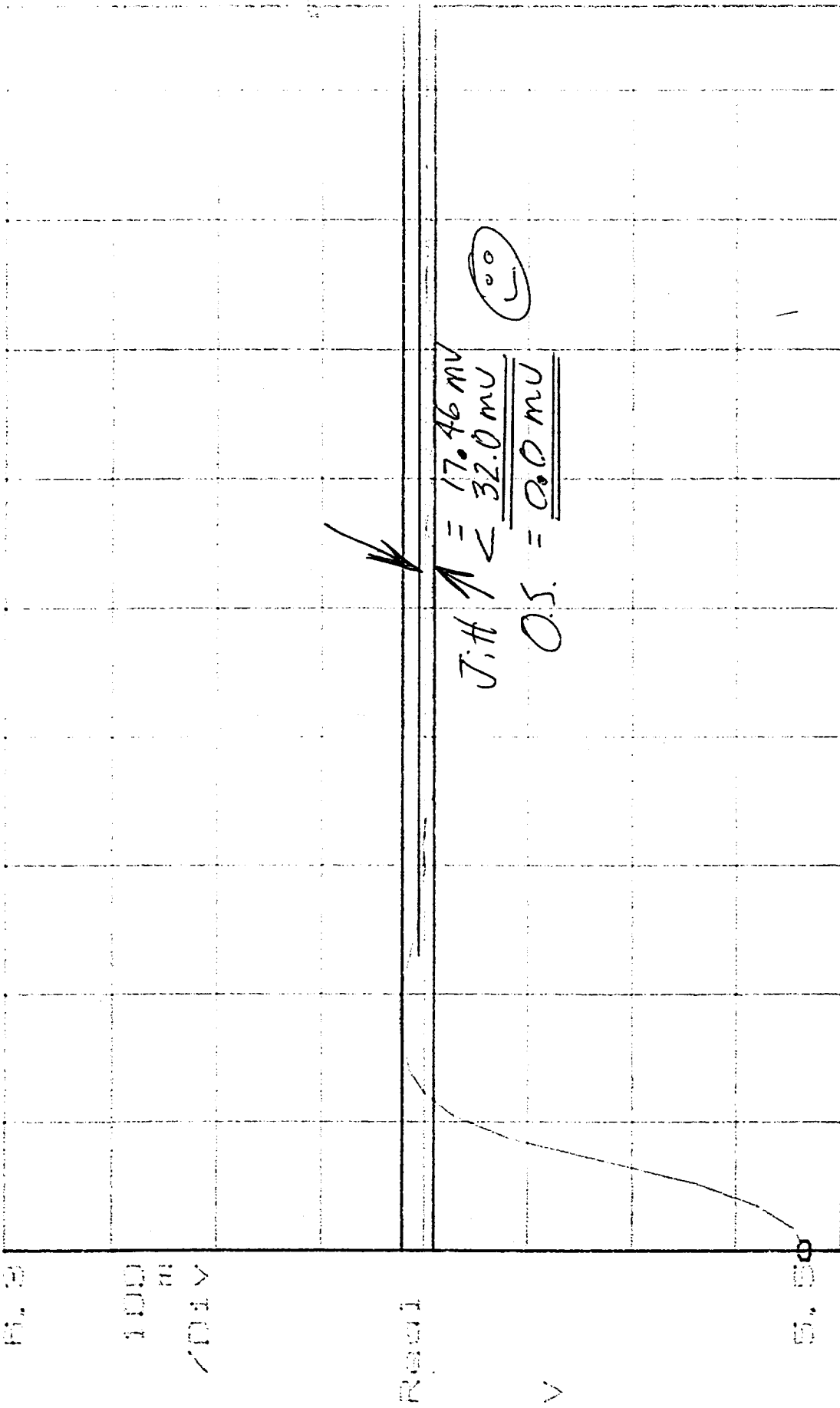
3.4.4.5 A1-2

S/N: 373249

P/N: 1331720-2-II SW: 106

$X=1.395\text{ S}$ $\Delta X=214.8\text{ mS}$ $Y=5.92182$ $\Delta Y=32.0\text{ mV}$
 $Y_a=5.53366$ $\Delta Y_a=473.6\text{ mV}$

GAP TIM BUF



FIXED X 1.30 SCENE 8

S/O: 373249

3.4.4.5 A1-2

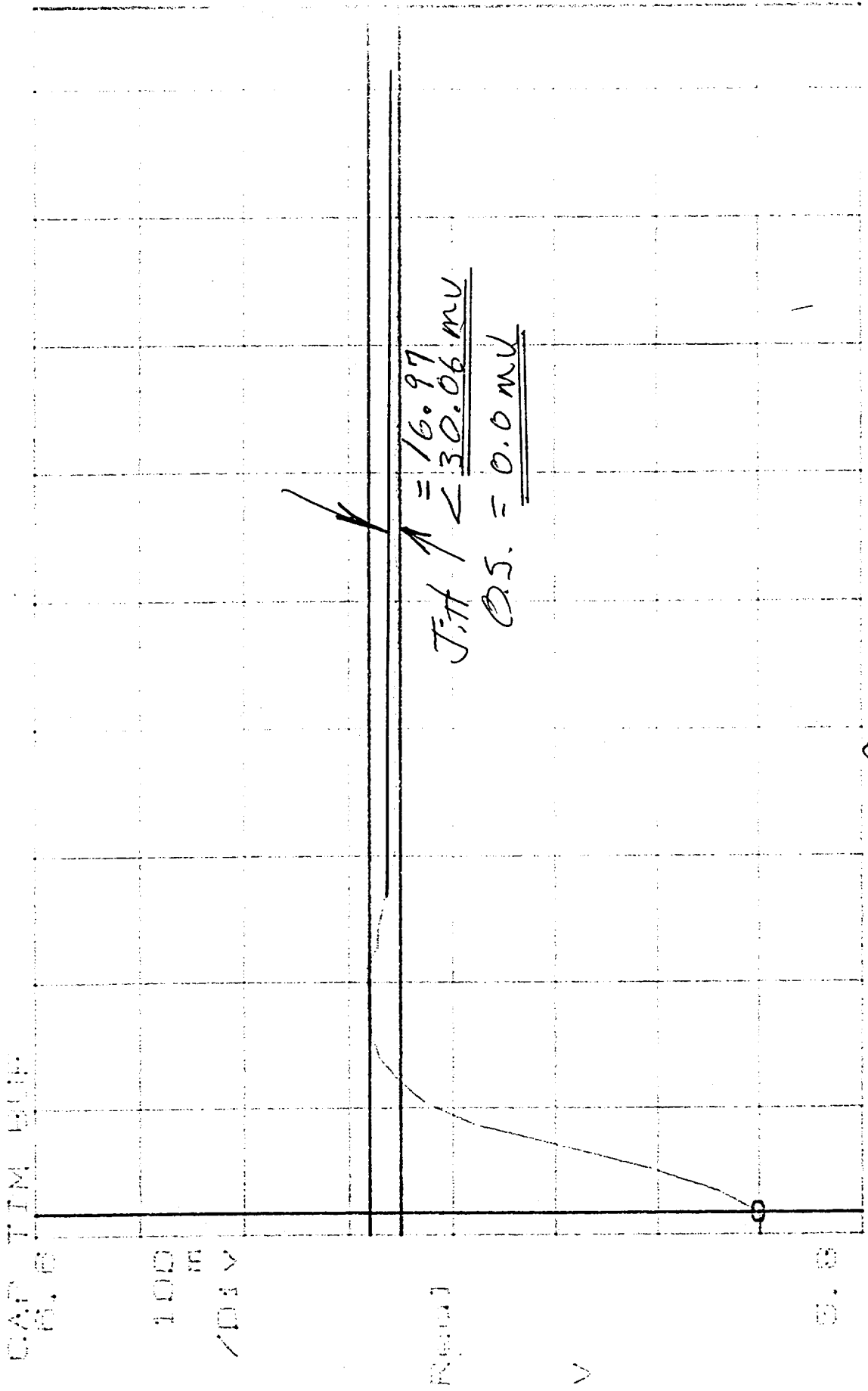
Test Eng: Date: 8-10-98

P/N: 1331720-2-1T SN: 106

Quality: TA 260

NOV 19 98

$X=1.602\text{ S}$ $\Delta X=210.9\text{ ms}$ $Y=6.28$ $\Delta Y=30.06\text{ mV}$
 $Y_0=5.9002$ $\Delta Y_0=473.6\text{ mV}$



4.4 AF - F. 265

SCENE 9

FXD X 1.0

Date: 8-18-98

Test Eng:

3.4.4.5 A1-2

S/O: 373249

1A

Quality:

P/N: 1331720-2-17 SN: 106

AUG 19 '98

X=1.805 S
Y=6.26835

$\Delta X = 214.8 \text{ ms}$
 $\Delta Y = 566.0 \text{ mV}$

Y=6.63248

$\Delta Y = 32.49 \text{ mV}$

CAP TIM 6.14

100

m

/DIV

Rec'd

V

6.2

EXD X 1.8

6.0

SCENE 10

4.4.1.00

S/O: 3732.49

3.4.4.5 A1-2

Test Eng:

TA
260

Date: 8-1-98

P/N: 1331720-2-1T SN: 106

Quality:

AUG 19 98

B44

X=2.004 S
Y=6.61055

$\Delta X = 214.8 \text{ ms}$
 $\Delta Y = 501.1 \text{ mV}$

Y=6.99951

$\Delta Y = 41.21 \text{ mV}$

CAP TIM BLUE
7.4

100

10

100 V

100.1

V

10.0

PRJ X 2.0

SCENE 11

4.4 NP 1.95

S/O: 373249

3.4.5 AI-2

Test Eng:

Date: 8-10-98

P/N: 1331720-2-II SW: 106

Quality:

7A
268

JUL 19 '98

X=2.211 S ΔX=210.9ms Y=7.35042 ΔY=32.49mV
Y0=6.98682 ΔY0=501.1mV

CAP. TIM. BUF

7.7

1000

100

100V

Rec'd

V

EX: J X: 0.01 SCENE 12

S/O: 373249 3.445. A1-2

P/N: 1331720-2-17 SN: 106

Test Eng:

Qualify:

AVSU
8
BLIT

TA
268

Date: 8-18-98

MUS 19 '98

846

$X=2.406\text{ S}$ $\Delta X=214.8\text{ ms}$ $Y=7.71357$ $\Delta Y=32.0\text{ mV}$
 $Y_0=7.32091$ $\Delta Y_0=459.0\text{ mV}$

CAP TIM 100
 8.1

100
 H
 /DIV

Regul

V

J.H L = 13.58 mV
 S.O = 0.0 mV
 0.0

100 X 10.43 SCENE 13

S/O: 373249

3.44.5 A1-2

Test Eng:

Date: 8-12-98

P/N: 1331720-2-11 5N106

Quality: 74 258

116 25 98

847

X=2.609 S ΔX=218.7 mS Y=8.08339 ΔY=38.79 mV
Yd=7.68582 ΔYd=530.3 mV

DAF TIN 11/11
8.4

100
mV
/DIV

J.H. $\Delta = 21.82 \text{ mV}$
 $< 35.9 \text{ mV}$
O.S. = 2.90 mV



END X 0.01 SEC: SCENE 14

S/O: 373249

3.4.4.5 A1-2

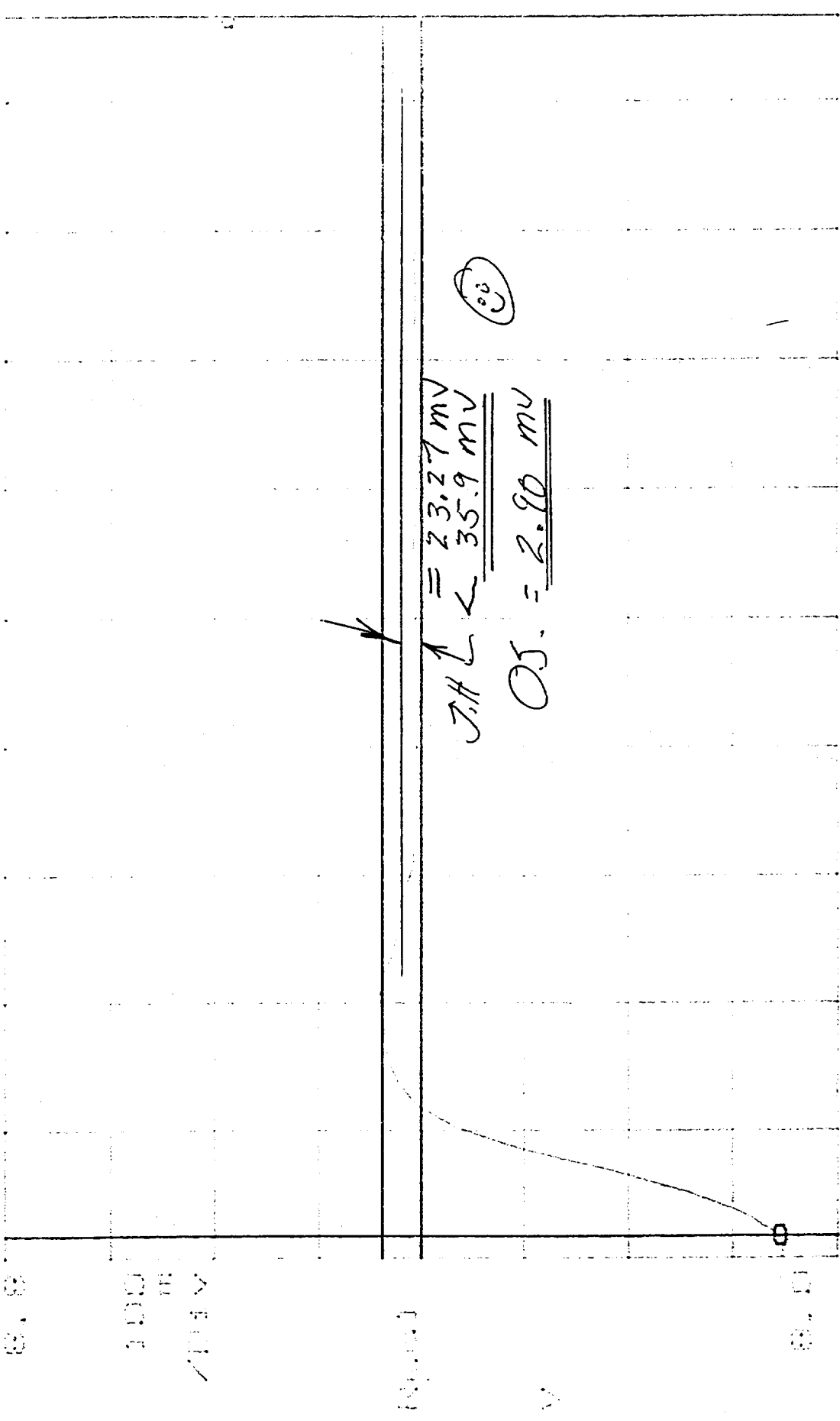
Test Eng: Date: 8-19-98

P/N: 1331720-2-17 SN: 106

Quality: TA 268

$X=2.816\text{ S}$ $\Delta X=214.8\text{ ms}$ $Y=8.4383$ $\Delta Y=38.79\text{ mV}$
 $Y_0=8.05398$ $\Delta Y_0=533.6\text{ mV}$

CAP TIM 1000



1000 X 2.81 SCENE 15

S/o: 373249 3 A.4.5 A1-2 Test Eng: (8) Date: 8-19-98
 P/N: 1331720-2-11 SN: 106 Quality: TA 268 AUG 23 '98

X=3.02 S ΔX=214.8mS Y=8.79612 ΔY=39.76mV
Yc=8.41078 ΔYc=544.9mV

DATE TIME 07:00
01.8

1000
mV

1000
mV

V

0.4

1000 X 9.10

0.10 SCENE 16



J.H L = 17.45 mV
35.9 mV
O.S. = 0.0 mV



Test Eng

Quality

Date: 8-12-98

AUG 25 '98

S/O: 373249

P/N: 1331720-2-11 SN: 106

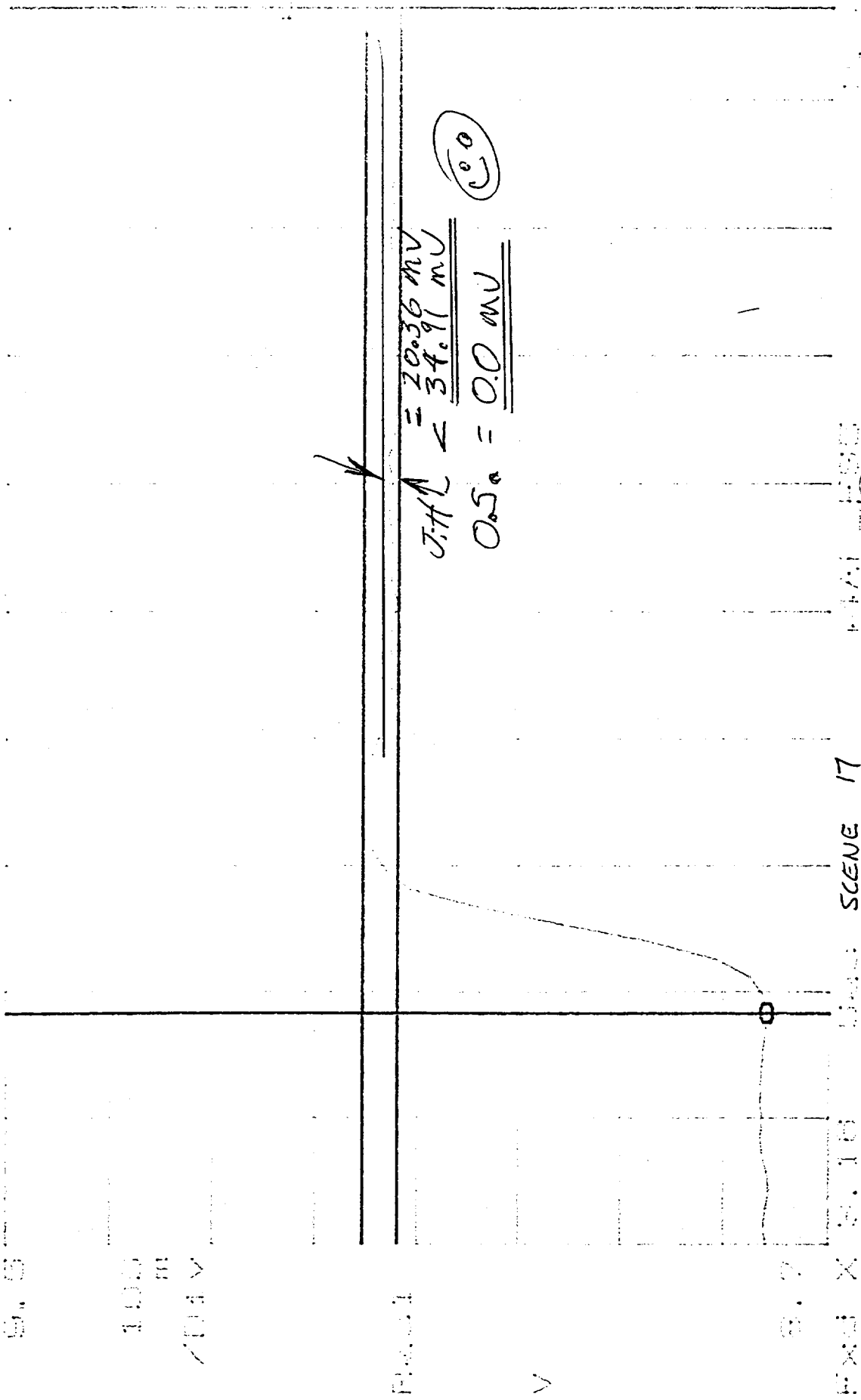
X=3.215 S ΔX=218.7 mS
Y=8.75785 ΔY=473.6 mV

Y=9.1543

ΔY=34.91 mV

CAP TIM 400
S. S

1000
m
V



S/O: 3132-49

3.4.4.5 A1-2

Test Eng:

Date: 8-18-98

P/N: 1331720-2-17 SW: 106

Quality:

TA
268

851

X=3.426 S ΔX=210.9ms
Y=9.13411 ΔY=472.0mV

Y=9.50582

ΔY=30.06mV

0.0

100

m

700V

Figure 1

V

↑
J.H. Δ = 15.03 mV
Δ = 30.06 mV
Q.S. = 0.0 mV

0.0

SCENE 1B

3.4.4.5 A1-2

SV: 373249

PN: 1331720-2-17 SN: 106

Test Eng:

Quality: 7A 268

ANNU
8
268

Date: 8-18-98

AUG 25 '98

B52

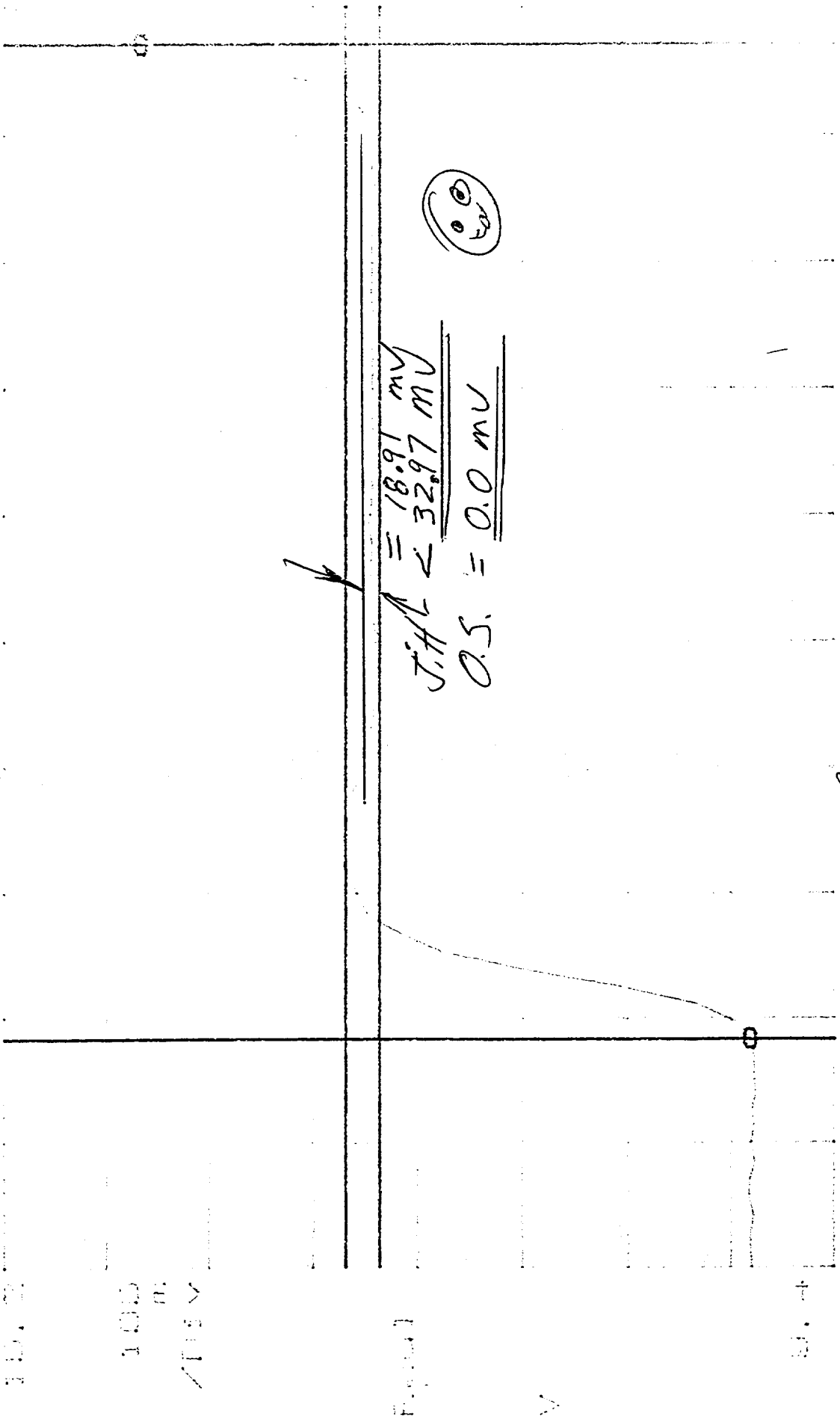
X=3.625 S

Y=9.86884

$\Delta X = 218.7 \text{ ms}$

$\Delta Y = 32.97 \text{ mV}$

1000



SCENE 19

3.4.4.5 A1-2

Test Eng.

Date: 8/11

74
268

Quality

S/O: 373249

P/N: 1331720-2-17

SN: 106

AUG 25 '98

X=3.828 S ΔX=222.7ms Y=10.2349 ΔY=38.79mV
Y_a=9.84934 ΔY_a=655.2mV

100
10.0

100
10.0



$\Delta V_{diff} = 19.39 \text{ mV}$
 $\Delta V_{diff} = 35.9 \text{ mV}$
 $O.S. = 3.01 \text{ mV}$



SCENE 20

S/O: 373249

3.4.4.5 A1-2

Test Eng'

ANSU
B
SET

Date: 8-17-98

P/N: 1331720-2-IT 50: 106

Quality:

24
268

AUG 25 '98

X=4.031 S ΔX=222.7mS Y=10.5913 ΔY=32.97mV
Yc=10.2045 ΔYc=668.2mV

DATE TIME 11.0

1000
m
V

1000

V

1000

Fixed X 3.500

SCENE 21



UHL = 18.42 mV
= 32.97 mV
O.S. = 0.0 mV

CO

510: 373249

34.45 A1-2

Test Eng:

ANSU
B
SET

Date: 8-19-98

P/N: 1331720-2-11 SN: 106

24
368

Quality:

AUG 25 '98

855

X=4.234 S ΔX=207.0ms Y=10.9431 ΔY=28.12mV
Yc=10.5678 ΔYa=379.5mV

DATA TIME 11.1

100
m
V

V.H.L. = 19.39 mV
O.S. = 28.12 mV
O.S. = 0.0 mV



SCENE 22



Test Eng. Date: 8-19-98

3.4.5 A1-2

S/O: 373249

PN: 1331720-2-17 SN: 106

Quality: 74 26g

AUG 25 98

BS6

X=4.652 S
Ya=11.442

$\Delta X=226.6 \text{ ms}$
 $\Delta Ya=523.8 \text{ mV}$

Y=11.315

$\Delta Y=34.91 \text{ mV}$

10.5

10.5

10.5

10.5

10.5

10.5

56' 373249

PN' 1331720-2-17 SN' 106

SCENE 23

3.4.4.5 A1-2

Test Eng:

Quality

Date: 8-19-98

AUG 25 '98

B57

X=4.641 S
Y=11.665
 $\Delta X=214.8\text{ms}$
 $\Delta Y=35.88\text{mV}$

Y=11.665

$\Delta X=214.8\text{ms}$
 $\Delta Y=35.88\text{mV}$

X=4.641 S
Y=11.665

DATE TIME

100
100

✓

$J.H.L = 19.39\text{mV}$
 $0.5. = 35.88\text{mV}$
 $0.5. = 0.0\text{mV}$

30

SCENE 2A

3.7.4.5 A1-2

SNO: 373249

PN: 1331720-2-17 SN: 106

Test Eng:

Quality:

0

24

ANS 25 76

B58

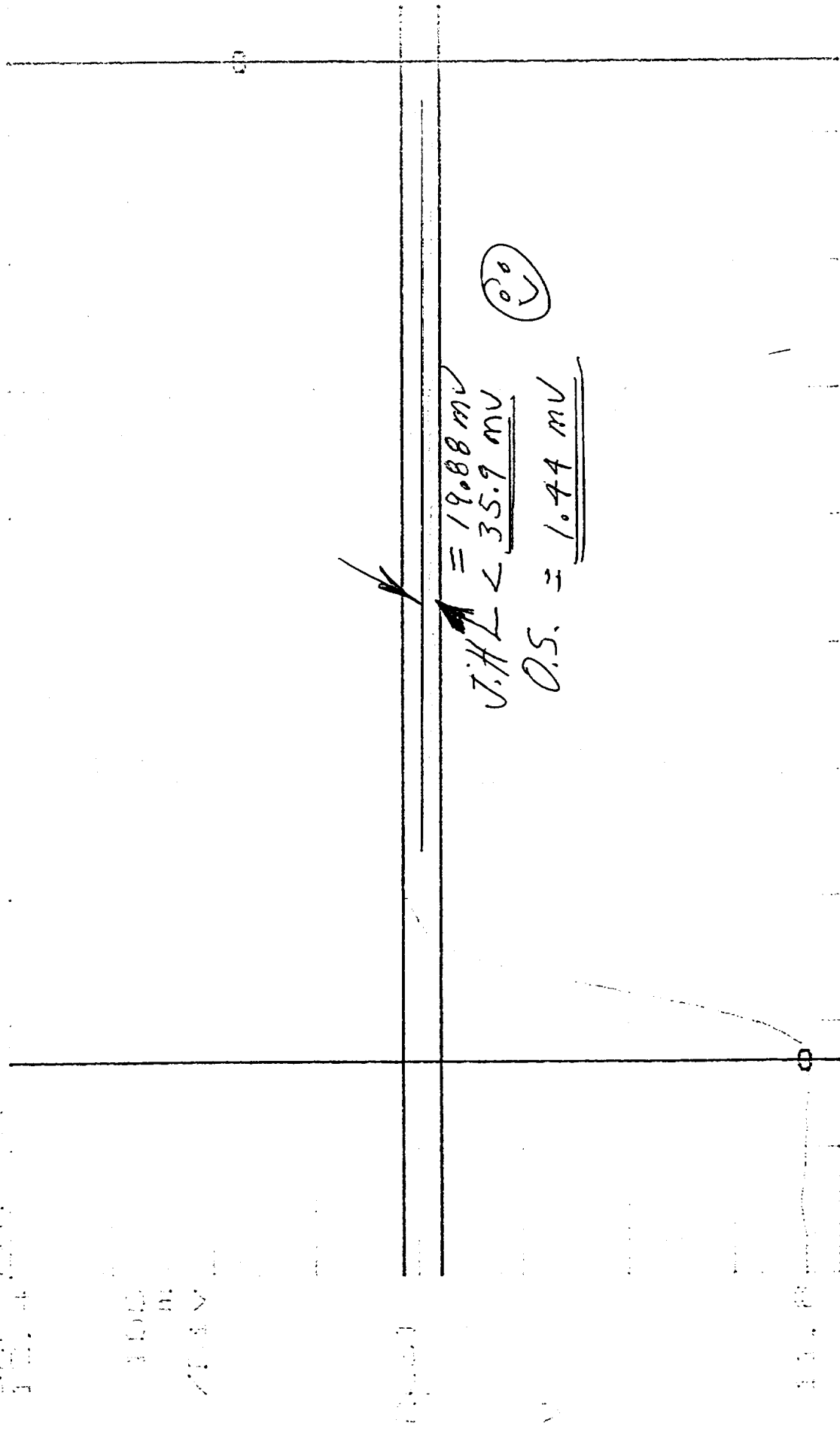
X=4.84 S
Y=11.6333

$\Delta X = 218.7 \text{ ms}$
 $\Delta Y = 538.4 \text{ mV}$

Y=12.015

$\Delta Y = 37.33 \text{ mV}$

100
mV



SCENE 25

3.445 A1-2

Test Eng:

Date: 8-19-98

S/N: 1331720-2-17 SN: 106

Quality:

(268)

MIS 25 98

B59

X=5.043 S ΔX=222.7ms Y=12.3761 ΔY=36.36mV
Yc=11.9853 ΔYc=637.4mV

DATE: 8-11-96

TIME

ADDS

↓
V_{TH} = 24.73mV
 < 35.9mV
O.S. = 0.47mV

(V_{TH})

TIME

DATE: 8-11-96

TIME

SCENE 26

3.4.4.5 A1-2

Test Eng.

Date: 8-11-96

SN: 373249 SN: 106

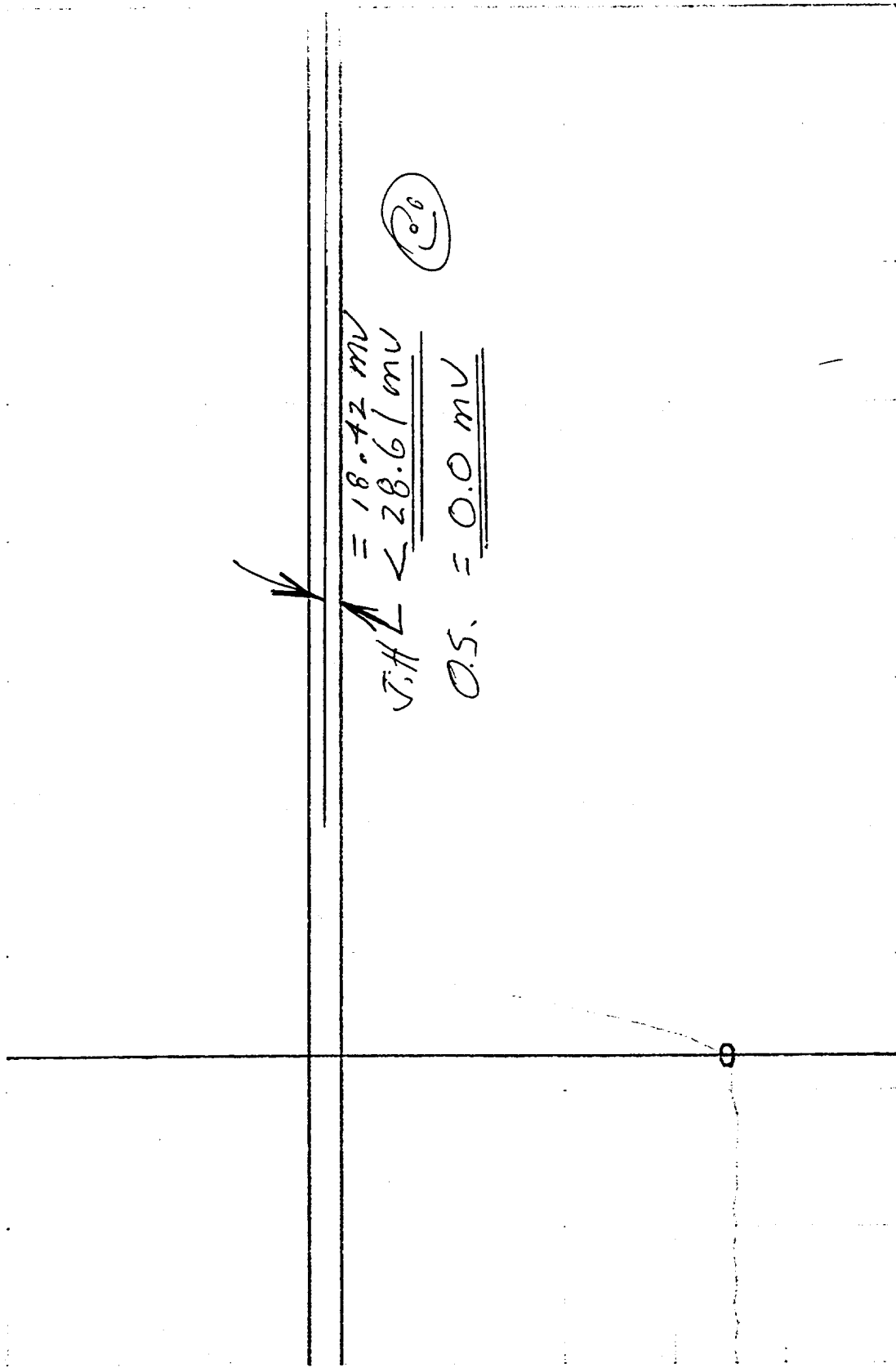
Quality:

(24/268)

AUG 25 '96

B60

X=5.25 S ΔX=210.9mS Y=12.7309 ΔY=28.61mV
Yc=12.3518 ΔYc=463.8mV



SCENE 27

3.4.4.5 A1-2

S/O: 373249

P/N: 1331720-2-17 SN: 106

Test Eng:

Quality:



Date: 8-19-98

AUG 28 '98

BCA

X=5.453 S ΔX=214.8ms Y=13.0892 ΔY=35.39mV
Y0=12.7119 ΔY0=559.5mV

CAP TIM BUF
13.4

100
m
/Div

Real

V

12.6

Fxd X 5.39 Sec SCENE 28 44AP_FSS5

5.67

S/O: 373249

3.4.4.5 A1-2

Test Eng.

Date: 8-12-98

P/N: 1331720-2-17 SN: 106

Quality:

24
269

AUG 25 '98

862

X=5.652 S ΔX=218.7mS Y=13.4441 ΔY=35.39mV
 Y=13.0589 ΔY=572.5mV

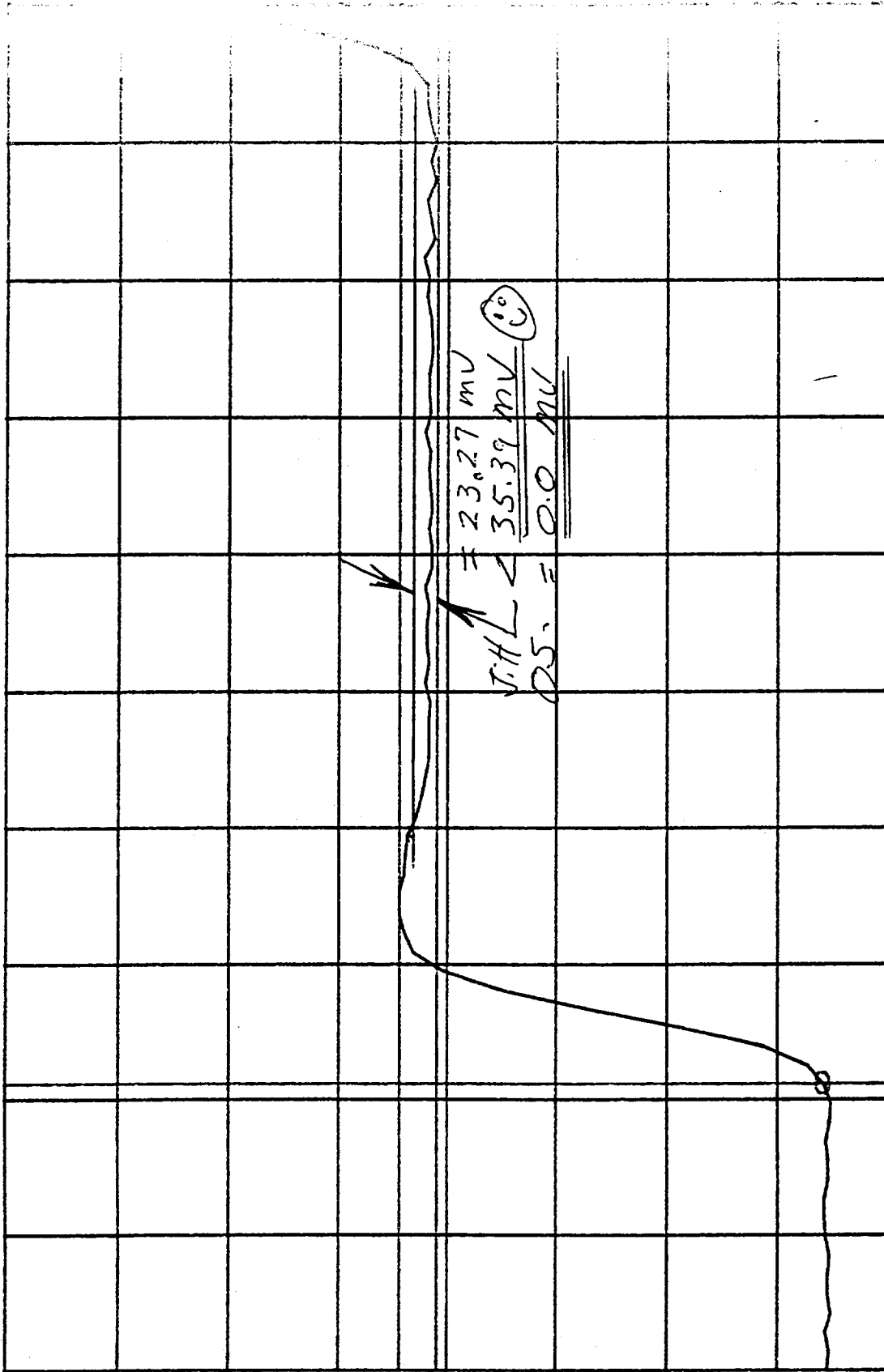
CAP TIM BUF
 13.8

100 m
 /Div

Real

V

13.0



Fxd X 5.59 Sec SCENE 29 44AP_FS5

5.87

S/O: 373249

3.4.4.5 A1-2

Test Eng:

Date: 8-11-98

P/N: 1331720-2-17 SN: 106

Quality:



NO 25 '90

B63

X=5.855 S ΔX=214.8mS Y=13.8082 ΔY=39.27mV
Y_a=13.419 ΔY_a=496.3mV

CAP TIM BUF

14.2

100

m

/Div

Real

V

13.4

Fxd X 5.8 Sec SCENE 30 44AP_FS5

S/o: 373249

3.4.9.5 A1-2

Test Eng'

Date: 8-19-03

P/N: 1331720-2-11 SN: 106

Quality:

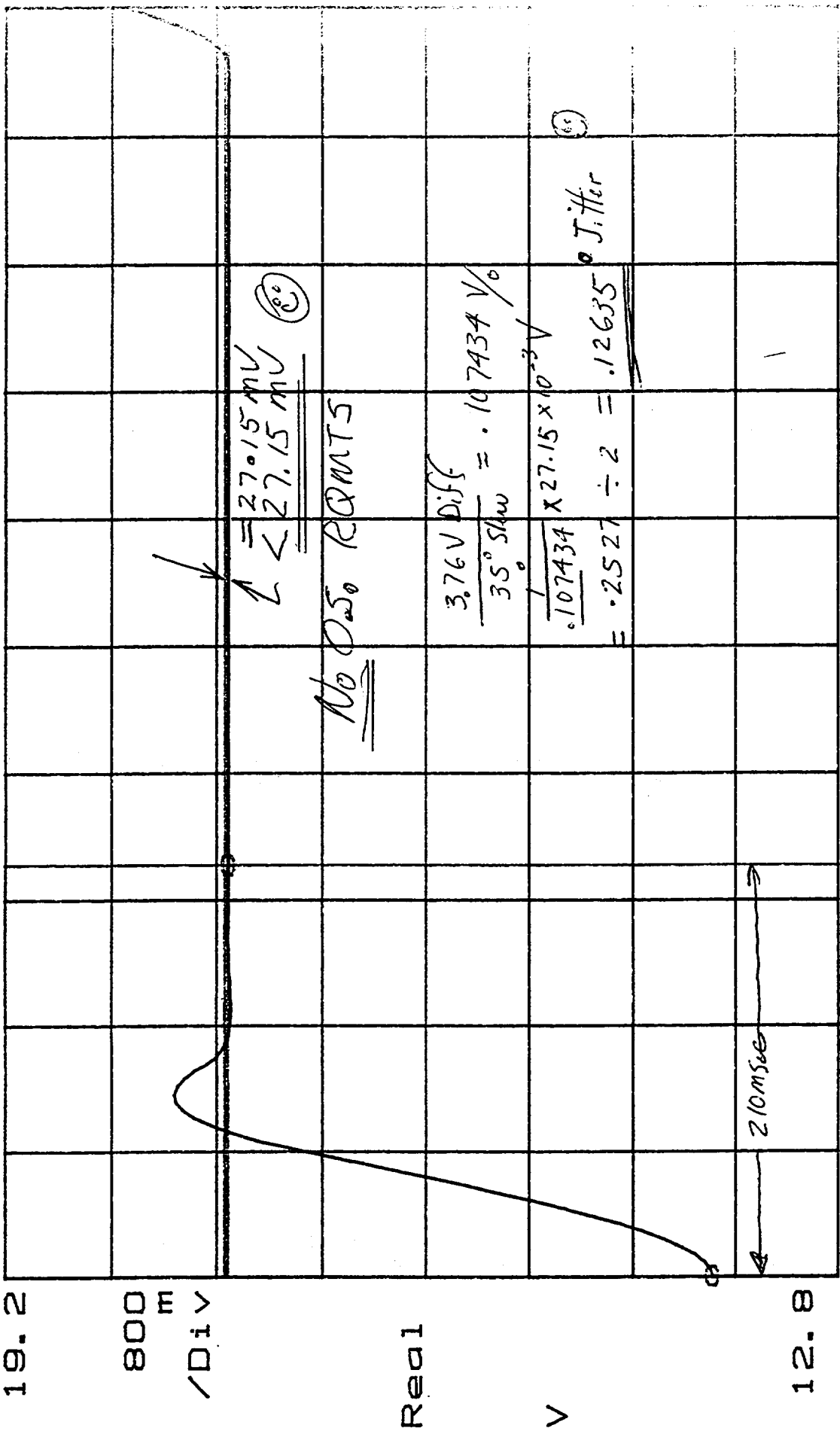
24
268

AN80-20-98

B64

X=6.059 S ΔX=210.9ms Y=17.536 ΔY=27.15mV
 Yd=13.7774 ΔYd=3.729 V

CAP TIM BUF
 19.2



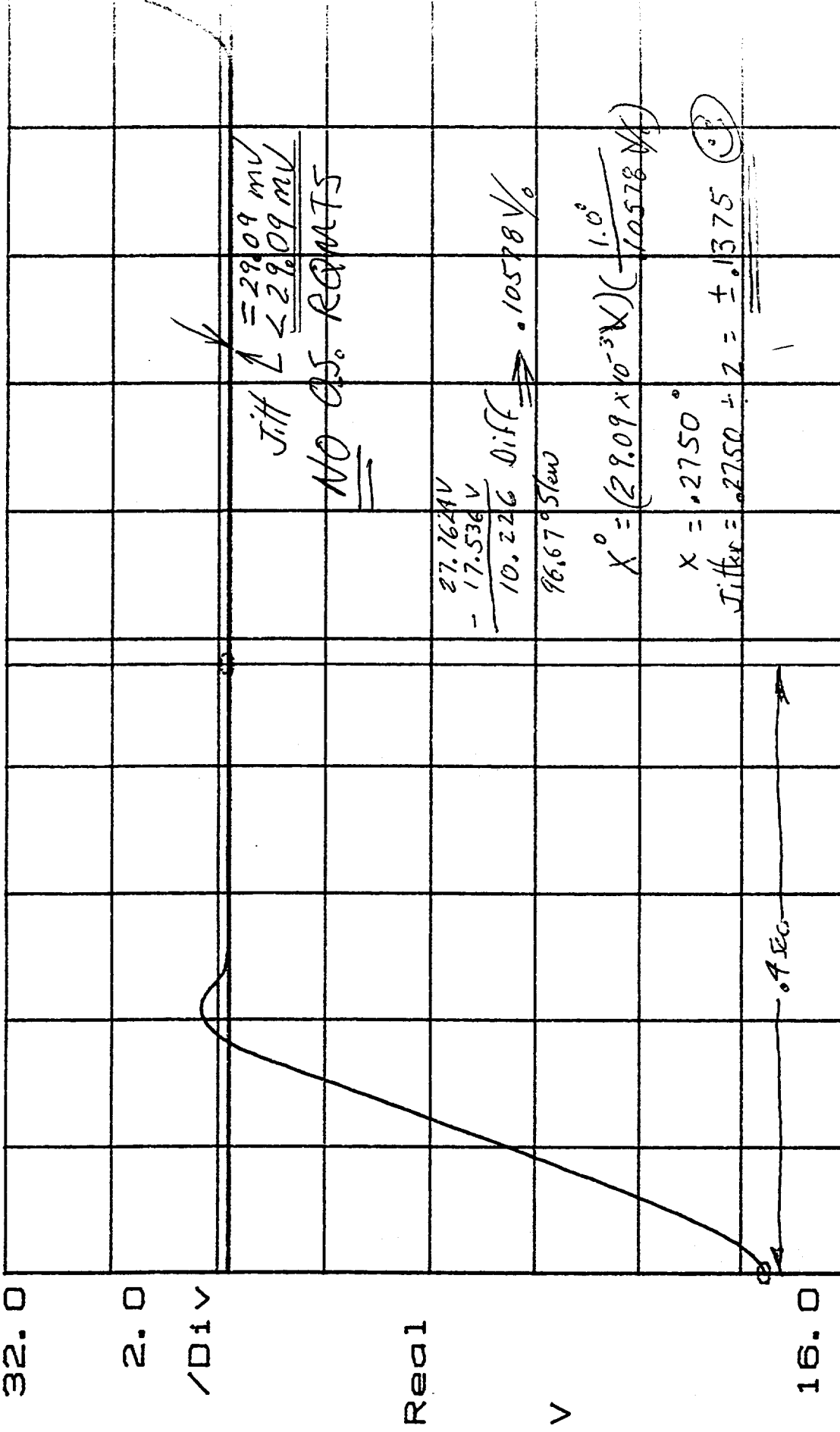
Fixd X 6.06 Sec CAL CAL 44AP_FS5 B.

S/O: 373249 3.4.4.5 A1-2 Test Eng: Date: 8-17-98

P/N: 1331720-2-1T SN: 106 Quality: 24 268

X=6.68 S ΔX=402.3ms V
 Y=17.5319 ΔY=29.09mV

CAP TIM BUF
 32.0



Fxd X 6.68 Sec WARM CAL 44AP_F55 7.5

S/O: 3732.49

3.1.4.5 A1-2

Test Exp:

Date: 8-19-11

P/W: 1331720-2-II SW: 106

Quality:

23A
268

ANSI
Z39.5-1991

B66

TEST DATA SHEET 7 (Sheet 1 Of 4)
Scan Motion and Jitter Test (A1-1) (Paragraph 3.4.4.5)

Test Setup Verified:

Ray Herbert
Signature

Shop Order No. 373249

Step No.	Description	Requirement	Test Result	Pass/Fail
7	--	Stepping Slewing <8 sec period per Figure 6	<8.0 sec	P
9	Scene 1-2 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7	17.14 mV	P
		< 3% overshoot for 10 msec	0.0 mV	P
10	Scene 2-3 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7	21.33 mV	P
		< 3% overshoot for 10 msec	1.0 mV	P
11	Scene 3-4 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7	20.36 mV	P
		< 3% overshoot for 10 msec	0.0 mV	P
12	Scene 4-5 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7	25.21 mV	P
		< 3% overshoot for 10 msec	0.0 mV	P
13	Scene 5-6 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7	30.06 mV	P
		< 3% overshoot for 10 msec	10.8 mV	P
14	Scene 6-7 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7	22.3 mV	P
		< 3% overshoot for 10 msec	5.0 mV	P
15	Scene 7-8 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7	19.88 mV	P
		< 3% overshoot for 10 msec	4.53 mV	P
16	Scene 8-9 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7	21.82 mV	P
		< 3% overshoot for 10 msec	0.0 mV	P

Pass = P
Fail = F

TEST DATA SHEET 7 (Sheet 2 Of 4)
Scan Motion and Jitter Test (A1-1)

Step No.	Description	Requirement	Test Result	Pass/Fail
17	Scene 9-10 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	22.3 mV 3.07 mV	P
18	Scene 10-11 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	25.21 mV 5.5 mV	P
19	Scene 11-12 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	16.0 mV 2.1 mV	P
20	Scene 12-13 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	17.45 mV 0.0 mV	P
21	Scene 13-14 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	20.85 mV 3.07 mV	P
22	Scene 14-15 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	26.18 mV 9.37 mV	P
23	Scene 15-16 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	17.45 mV 0.0 mV	P
24	Scene 16-17 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	27.15 mV 4.53 mV	P

Pass = P
Fail = F

TEST DATA SHEET 7 (Sheet 3 Of 4)
Scan Motion and Jitter Test (A1-1)

Step No.	Description	Requirement	Test Result	Pass/Fail
25	Scene 17-18 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	23.27 mV	P
		< 3% overshoot for 10 msec	5.5 mV	P
26	Scene 18-19 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	25.21 mV	P
		< 3% overshoot for 10 msec	9.38 mV	P
27	Scene 19-20 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	16.49 mV	P
		< 3% overshoot for 10 msec	0.0 mV	P
28	Scene 20-21 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	25.7 mV	P
		< 3% overshoot for 10 msec	11.32 mV	P
29	Scene 21-22 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	21.82 mV	P
		< 3% overshoot for 10 msec	0.0 mV	P
30	Scene 22-23 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	23.76 mV	P
		< 3% overshoot for 10 msec	0.0 mV	P
31	Scene 23-24 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	16.49 mV	P
		< 3% overshoot for 10 msec	0.0 mV	P
32	Scene 24-25 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	23.76 mV	P
		< 3% overshoot for 10 msec	5.49 mV	P

Pass = P
Fail = F

12 Feb 98

TEST DATA SHEET 7 (Sheet 4 Of 4)
Scan Motion and Jitter Test (A1-1)

Step No.	Description	Requirement	Test Result	Pass/Fail
33	Scene 25-26 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	20.37 mV 0.0 mV	P
34	Scene 26-27 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	16.48 mV 0.0 mV	P
35	Scene 27-28 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	15.51 mV 0.0 mV	P
36	Scene 28-29 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	19.39 mV 0.0 mV	P
37	Scene 29-30 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	19.55 mV 0.0 mV	P
38	Scene 30 Cold Cal 35.0° slew	<0.21 sec slew time per Figure 10	< 210 msec	P
		< ±0.165° jitter per Figure 11	24-98 266° ±.1591°	P
39	Cold Cal - Warm Cal 96.67° slew	<0.40 sec slew time per Figure 12	< .40 sec	P
		< ±0.165° jitter per Figure 13	24-98 10.379° ±.13348°	P

Pass = P
Fail = F

METSAT S/c: 373249

Unit: AMSU A1 P/N: 1331720-2-1T

Serial No.: 106

Date: 8-24-98

Test Engineer:

Quality Assurance:

Customer Representative:



AUG 24 98

R. Brown 12-16-98

TEST DATA SHEET 8 (Sheet 1 Of 4)
Scan Motion and Jitter Test (A1-2) (Paragraph 3.4.4.5)

Test Setup Verified: Ray Herbig

Signature

Shop Order No. 373249

Step No.	Description	Requirement	Test Result	Pass/Fail
44	--	Stepping Slewing <8 sec period per Figure 6	< 8.0 sec	P
9	Scene 1-2 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	16.97 mV	P
		< 3% overshoot for 10 msec	2.9 mV	P
10	Scene 2-3 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	14.55 mV	P
		< 3% overshoot for 10 msec	12.0 mV	P
11	Scene 3-4 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	14.55 mV	P
		< 3% overshoot for 10 msec	0.0 mV	P
12	Scene 4-5 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	16.0 mV	P
		< 3% overshoot for 10 msec	3.38 mV	P
13	Scene 5-6 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	13.09 mV	P
		< 3% overshoot for 10 msec	0.47 mV	P
14	Scene 6-7 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	15.52 mV	P
		< 3% overshoot for 10 msec	0.0 mV	P
15	Scene 7-8 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	17.46 mV	P
		< 3% overshoot for 10 msec	0.0 mV	P
16	Scene 8-9 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	16.97 mV	P
		< 3% overshoot for 10 msec	0.0 mV	P

Pass = P
Fail = F

TEST DATA SHEET 8 (Sheet 2 Of 4)
Scan Motion and Jitter Test (A1-2)

Step No.	Description	Requirement	Test Result	Pass/Fail
17	Scene 9-10 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	16.49 mV 0.0 mV	P
18	Scene 10-11 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	14.06 mV 5.32 mV	P
19	Scene 11-12 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	11.15 mV 0.0 mV	P
20	Scene 12-13 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	13.58 mV 0.0 mV	P
21	Scene 13-14 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	21.82 mV 2.90 mV	P
22	Scene 14-15 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	23.27 mV 2.90 mV	P
23	Scene 15-16 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	17.45 mV 0.0 mV	P
24	Scene 16-17 3.33° step	<35 msec rise time per Figure 7	<35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	20.56 mV 0.0 mV	P

Pass = P
Fail = F

TEST DATA SHEET 8 (Sheet 3 Of 4)
Scan Motion and Jitter Test (A1-2)

Step No.	Description	Requirement	Test Result	Pass/Fail
25	Scene 17-18 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	15.03 mV 0.0 mV	P
26	Scene 18-19 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	18.91 mV 0.0 mV	P
27	Scene 19-20 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	19.39 mV 3.01 mV	P
28	Scene 20-21 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	18.42 mV 0.0 mV	P
29	Scene 21-22 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	19.39 mV 0.0 mV	P
30	Scene 22-23 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	17.45 mV 0.0 mV	P
31	Scene 23-24 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	19.39 mV 0.0 mV	P
32	Scene 24-25 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	19.08 mV 1.44 mV	P

Pass = P
Fail = F

TEST DATA SHEET 8 (Sheet 4 Of 4)
Scan Motion and Jitter Test (A1-2)

Step No.	Description	Requirement	Test Result	Pass/Fail
33	Scene 25-26 3.33° step	<35 msec rise time per Figure 7	< 35 msec	A
		< ±5% jitter per Figure 7	24.73 mV	P
		< 3% overshoot for 10 msec	0.97 mV	P
34	Scene 26-27 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	18.42 mV	P
		< 3% overshoot for 10 msec	0.0 mV	P
35	Scene 27-28 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	19.88 mV	P
		< 3% overshoot for 10 msec	0.0 mV	P
36	Scene 28-29 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	23.27 mV	P
		< 3% overshoot for 10 msec	0.0 mV	P
37	Scene 29-30 3.33° step	<35 msec rise time per Figure 7	< 35 msec	P
		< ±5% jitter per Figure 7	19.88 mV	P
		< 3% overshoot for 10 msec	3.38 mV	P
38	Scene 30 Cold Cal 35.0° slew	<0.21 sec slew time per Figure 10	< 0.21 sec	P
		< ±0.165° jitter per Figure 11	± .126°	P
39	Cold Cal - Warm Cal 96.67° slew	<0.40 sec slew time per Figure 12	174ms	P
		< ±0.165° jitter per Figure 13	± .135°	P
				PASS

Pass = P
Fail = F

S/O: 373249
Unit: METSAT
AMSU A1 P/N: 1331720-2-1T
Serial No.: 106
Date: 8-24-98

Test Engineer: AMSU 8 SEIT
Quality Assurance: 74 260 JUG 24 '98
Customer Representative: R. Brown 12-16-98

APPENDIX C

***PULSE LOAD CURRENT WAVEFORM
AND TEST DATA SHEET***

Time Capture

MEASURE:	CHAN 1	CHAN 2
	Power Spec	Off
WINDOW:	CHAN 1	CHAN 2
	Hanning	Hanning
AVERAGE:	TYPE	# AVGS
	Avg Off	10
FREQ:	CENTER	SPAN
	500 Hz	1.0KHz
	REC LGTH	BW
	800ms	1.87 Hz
	Δt	
	391 μ S	
TRIGGER:	TYPE	LEVEL
	External	1.0 Vpk
	SLOPE	Neg
INPUT:	RANGE	ENG UNITS
CH 1	AutoRng	1.0 V/EU
CH 2	AutoRng \uparrow	1.0 V/EU
SOURCE:	TYPE	COUPLING
	Off	DC (Gnd)
		DC (Gnd)
	LEVEL	DELAY
	0.0 Vpk	0.0 S
	OFFSET	0.0 S
	0.0 Vpk	0.0 Vpk

810' 373249

3A4.6

Test Eng: ()

Date: 8-24-78

AN: 1331720-2-17 SN: 106

Quality: _____

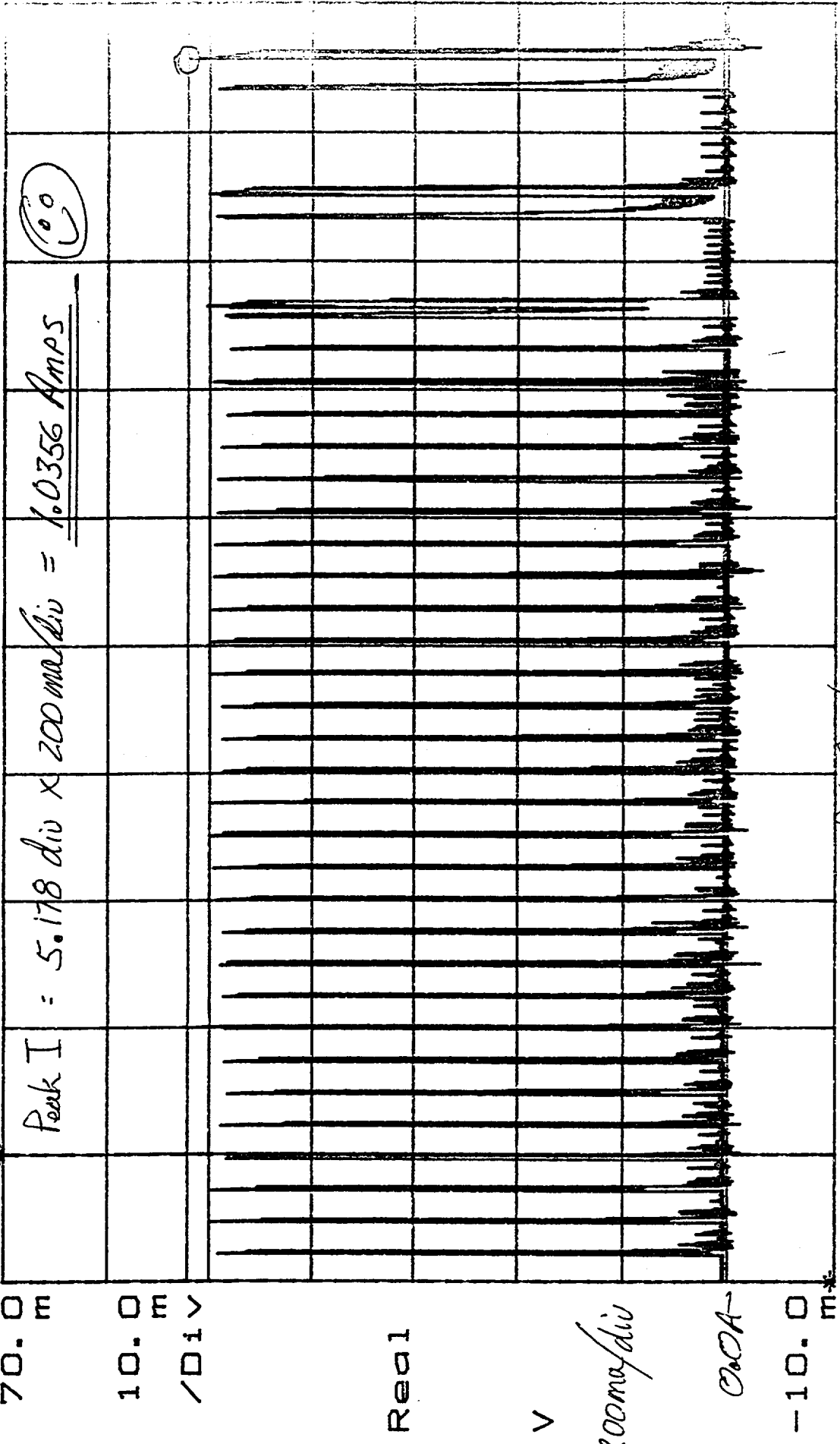
74
268

AUG 25 '78

C1-1

Y=26.2182m ΔY=51.78mV

CAP TIM BUF



70.0 m
10.0 m
/Div
Peak I = 5.178 div x 200ma/div = 1.0356 Amps
Peak I
Real
V
200ma/div
0.0A
-10.0 mV
Fxd Y 0.0
Sec +28V Bus Peak Current 4PLB
8.0
56: 373249
P/W: 1331720-2-17 SN: 106
Date: 8-19-98
Test Eng:
Quality:
C1-2

TEST DATA SHEET 9
28V Bus Peak Current and Rise Time Test (Paragraph 3.4.4.6)

Test Setup Verified: Ray H. H. H.

Signature

Shop Order No. 3732 49

Step No.	Requirement	Test Result	Pass/Fail
4	< 1 A peak any place in the scan	1.0356 Amps	P
5	> 35 μ sec rise time, 3.33° step	1.953 msec	P
6	> 35 μ sec rise time, start of WC slew	2.344 msec	P
6	> 35 μ sec rise time, end of WC slew	4.687 msec	P

Pass = P
Fail = F

Unit: METSAT A1 P/N: 1331720-2-1T
Serial No.: 106

Test Engineer: AMSU 8 9517

Quality Assurance: 892 STL

AUG 25 '98

Date: 8-24-98

APPENDIX D
***GAIN AND PHASE MARGIN PLOTS
AND TEST DATA SHEETS***

Swept Sine

AVERAGE: INTGRT TIME # AVGS
 <1.0 S 5

FREQ: START 999.99 mHz SPAN 3.0 Dec
 STOP 1 KHz RESLTN 16.7 Pct/Hz

SWEEP: TYPE Log DIR Up
 EST TIME 4.58 Min EST RATE 91.7 S/Dec

AU GAIN: Off

INPUT: RANGE ENG UNITS COUPLING
 CH 1 AutoRng↑ 1.0 V/EU DC (Flt)
 CH 2 AutoRng↑ 1.0 V/EU DC (Flt)

SOURCE: TYPE Off
 LEVEL 1.0 Vpk OFFSET 0.0 Vpk

S/N: 373249

3.4.4.8-12S

Test Eng:  Date: 3-8-98

P/N: 1331720-2-1T SN: 106

Qualtr: 

8-8-98

D1-1

X=59.994 Hz
Y=-13.665 dB
M: FREQ RESP
10.0

-15.232 mdB

-13.665 dB GAIN MARGIN

dB

-90.0

Fxd Y 999.99m Log Hz
Yb=-180.45 Deg
M: FREQ RESP
90.0

13GP_B31

113.61 - 180 = 66.39 deg PHASE MARGIN

Phase

Deg

-720

Fxd Y 999.99m Log Hz
3.4.8 A1-1

13GP_B31

SN: 3732.49

3.4.8 A1-1

Test Eng: 

Date: 2018

PN: 1331720-2-17 SN: 106

Quality: 3.5.22

X=58.384 Hz
 Yd=-13.671 dB
 M: FREQ RESP
 10.0

-21.761 mdB

13.671 dB GAIN MARGIN



dB

-90.0

Fxd Y 999.99m Log Hz
 Yb=-180.75 Deg
 M: FREQ RESP
 90.0

13GP_B21

66.65 deg PHASE MARGIN



113.35 deg - 180 =

Phase

Deg

-720

Fxd Y 999.99m Log Hz

13GP_B21

3.44.8 A1-1

Test Eng:

Date: 8-10-98

SN: 373249

PN: 1331720-2-17 SN: 106

Quality:

9.3.98

X=58.984 Hz
Y=-13.65 dB
M: FREQ RESP
10.0



← 13.65 dB Gain Margin

← -6.735 mdB

dB

-90.0

Fxd Y 999.99m Log Hz
Yb=-180.61 Deg
M: FREQ RESP
90.0

11GP_B12

1K



← 113.41 deg - 180.0 = 66.59 deg Phase Margin

Phase

Deg

-720

Fxd Y 999.99m Log Hz
3.448 A1-1

11GP_B12



Test Eng:

Quality:

S/N: 373249

P/N: 1331720-2-IT SN: 106



8.5.98

Date: 8.5.98

X=55.911 Hz
Y=-13.084 dB
M: FREQ RESP
10.0

-3.663 mdB

-13.084 dB GAIN MARGIN

dB

-90.0

Fxd Y 999.99m Log Hz
Yb=-180.47 Deg
M: FREQ RESP
90.0

13GP_B32

1K

120.07 deg - 180 = 59.93 deg PHASE MARGIN

Phase

Deg

-720

Fxd Y 999.99m Log Hz
344.8 A1-2

13GP_B32

1K

S/N: 373249

344.8 A1-2

Test Eng'

ASAP
210

Date: 8-5-98

PN: 1331720-2-IT SW: 106

Quality:

ASAP
210

AUG 6 '98

D4

X=55.911 Hz
Y=-13.08 dB
M: FREQ RESP
10.0

25.0543 mdB

13.08 dB GAIN MARGIN

dB

-90.0

Fxd Y 999.99m Log Hz
Yb=-180.41 Deg
M: FREQ RESP
90.0

13GP_B22

119.93 - 180 = 60.07 deg PHASE MARGIN

Phase

Deg

-720

Fxd Y 999.99m Log Hz
3.448 A1-2

13GP_B22

114

Sfo: 373249

3.448 A1-2

Test Eng:

ANSU
8
SEIT

Date: 8-5-98

PN: 1331720-2-17 SW: 106

Quality:

892
61

ANS 8 '98

05

X=55.911 Hz
Y=-12.969 dB
M: FREQ RESP
10.0

(00)

12.969 dB GAIN MARGIN

-9.351 mdB

dB

-90.0

Fxd Y 999.99m Log Hz
Yb=-180.75 Deg
M: FREQ RESP
90.0

13GP_B31

(00)

120.01 - 180 = 59.99 deg PHASE MARGIN

Phase

Deg

-720

Fxd Y 999.99m Log Hz

11GP_B13

1K

S/O: 3732.49

3.4.4.8 A1-2

ANBU
8
BUT

Test Eng'

P/N: 1331720-2-1T SN: 106

632
62

Quality

AUG 8 '98

Date: 8-5-98

DC

TEST DATA SHEET 10
Gain/Phase Margin (A1-1) (Paragraph 3.4.4.8)

Test Setup Verified: *Ray Hufberg*

Signature

Shop Order No. 373249

Temperature: 71.5°F °C

Requirement	Test Result		Pass/Fail
9.2 dB minimum	1	13.665 dB	P
	2	13.671 dB	
	3	13.65 dB	
	4		
	5		
25 degrees minimum	1	66.39 deg	P
	2	66.65 deg	
	3	66.59 deg	
	4		
	5		



Note: These mag
are from ECH

Deleted Per
Customer
Request
Ray Hufberg
1-21-98

Any/11/13
8/25/98

Pass = P
Fail = F

Unit: AMSU
METSAT A1 P/N: 1331720-2-1T
Serial No.: 106
Date: 8-24-98

Test Engineer: 
Quality Assurance:  AUG 25 '98
Customer Representative: *P. Brown* 12-16-98

TEST DATA SHEET 11
Gain/Phase Margin (A1-2) (Paragraph 3.4.4.8)

Test Setup Verified: Ray Huthberg
Signature

Shop Order No. 373249

Temperature: 71.5 °F
°C

Requirement	Test Result		Pass/Fail
9.2 dB minimum	1	13.084 dB	P
	2	13.08 dB	
	3	12.969 dB	
	4		
	5		
25 degrees minimum	1	59.93 deg	P
	2	60.07 deg	
	3	59.99 deg	
	4		
	5		

Note: These
Marks are from
ECN# 1828

Deleted Per
Customer
Request
Ray Huthberg
1-24-98

My ML's
8/25/98

Pass = P
Fail = F

Unit: MEISAT A1 P/N: 1331720-2-1T

Serial No.: 106

Date: 8-24-98

Test Engineer: _____

Quality Assurance: _____

Customer Representative: R. Brown 12-6-98



7A
268

AUG 26 98

APPENDIX E

***OPERATIONAL GAIN MARGIN POWER SPECTRUM
PLOTS AND TEST DATA SHEETS***

Linear Resolution

MEASURE:	CHAN 1 Off	CHAN 2 Power Spec
WINDOW:	CHAN 1 Uniform	CHAN 2 Uniform
AVERAGE:	TYPE Stable	# AVGS 3
FREQ:	CENTER 156.25 Hz	OVERLAP 0%
	REC LGTH 2.56 S	TIME AVG Off
	Δt 1.25ms	
TRIGGER:	TYPE Chan 2	SLOPE Neg
	LEVEL 0.0 Vpk	PREVIEW Off
INPUT:	RANGE	COUPLING
CH 1	AutoRng	DC (F1t)
CH 2	AutoRng	DC (F1t)
SOURCE:	TYPE Off	LEVEL 0.0 Vpk
		OFFSET 0.0 Vpk

S/O: 373249

3.4.4.9

Test Eng:

Date: 8-17-93

P/N: 1331720-2-17 SN: 106

Quality:

1A
258

MIS 25 '90

X=176.56 Hz
Y=-31.761 dBm rms

POWER SPEC2

-10

3AVG 0%OVL P Unif

10.0

/DIV

dBm

rms
V2

-90.0

FxdXY 0 Hz

A1-1

120F_P112

31

S/N: 373247

3.4.4.9

Test Eng:

AKSU
B
SEIT

Date: 8-19-13

P/N: 1331720-2-1T SN: 106

Qualify

TA
260

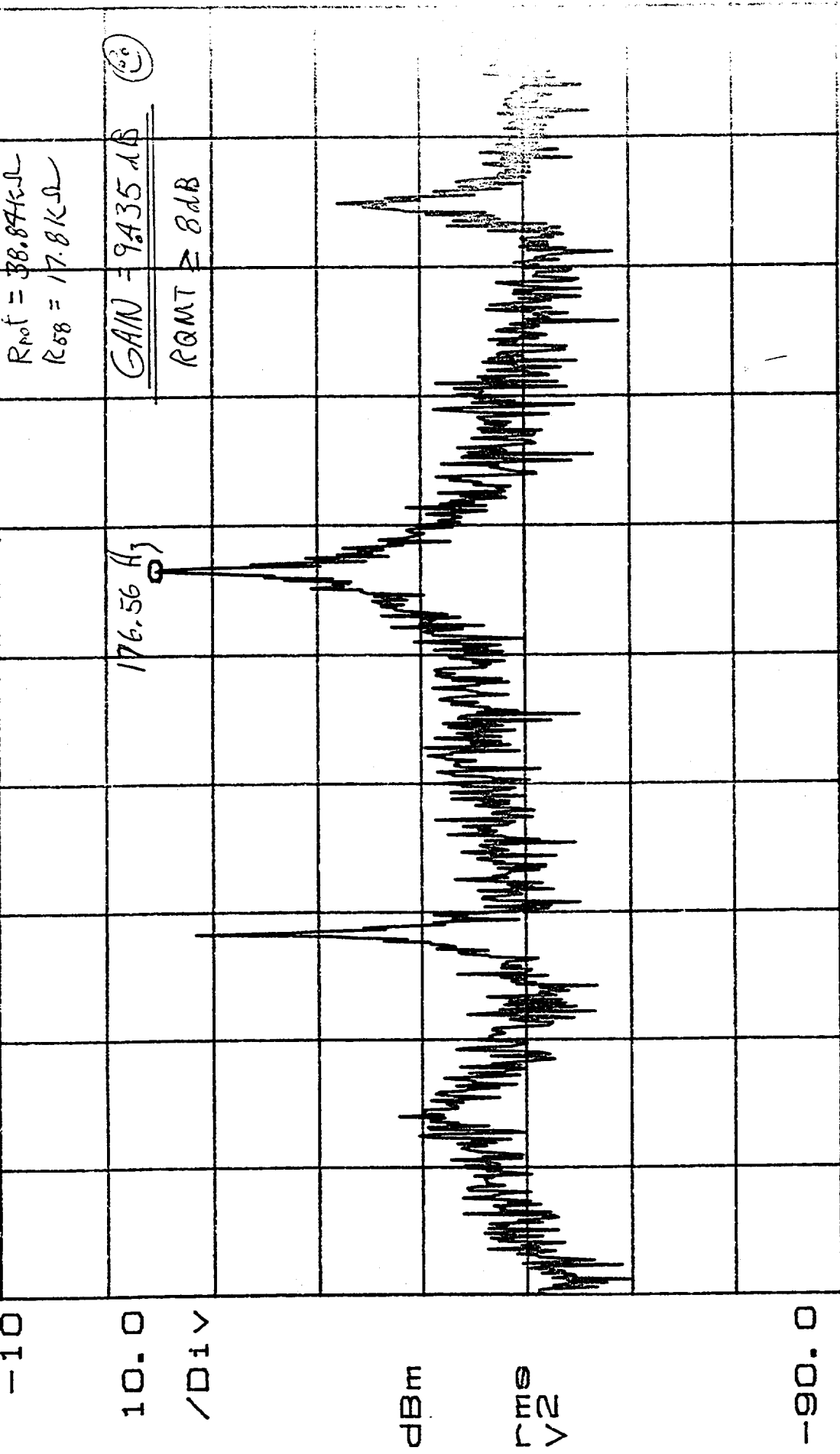
AUG 25 '99

E1-2

X=176.56 Hz
Y=-24.699 dBm rms

POWER SPEC2
-10

3AVG 0%OVLP Unif



-90.0

FXDXY 0 Hz

130F_P21

344.9 A1-1

Test Eng:

AMSU
B
SEIT

Date: 8-14-83

S/O: 373249

P/N: 1331720-2-IT SN: 106

Qualify

TA
260

AUG 25 93

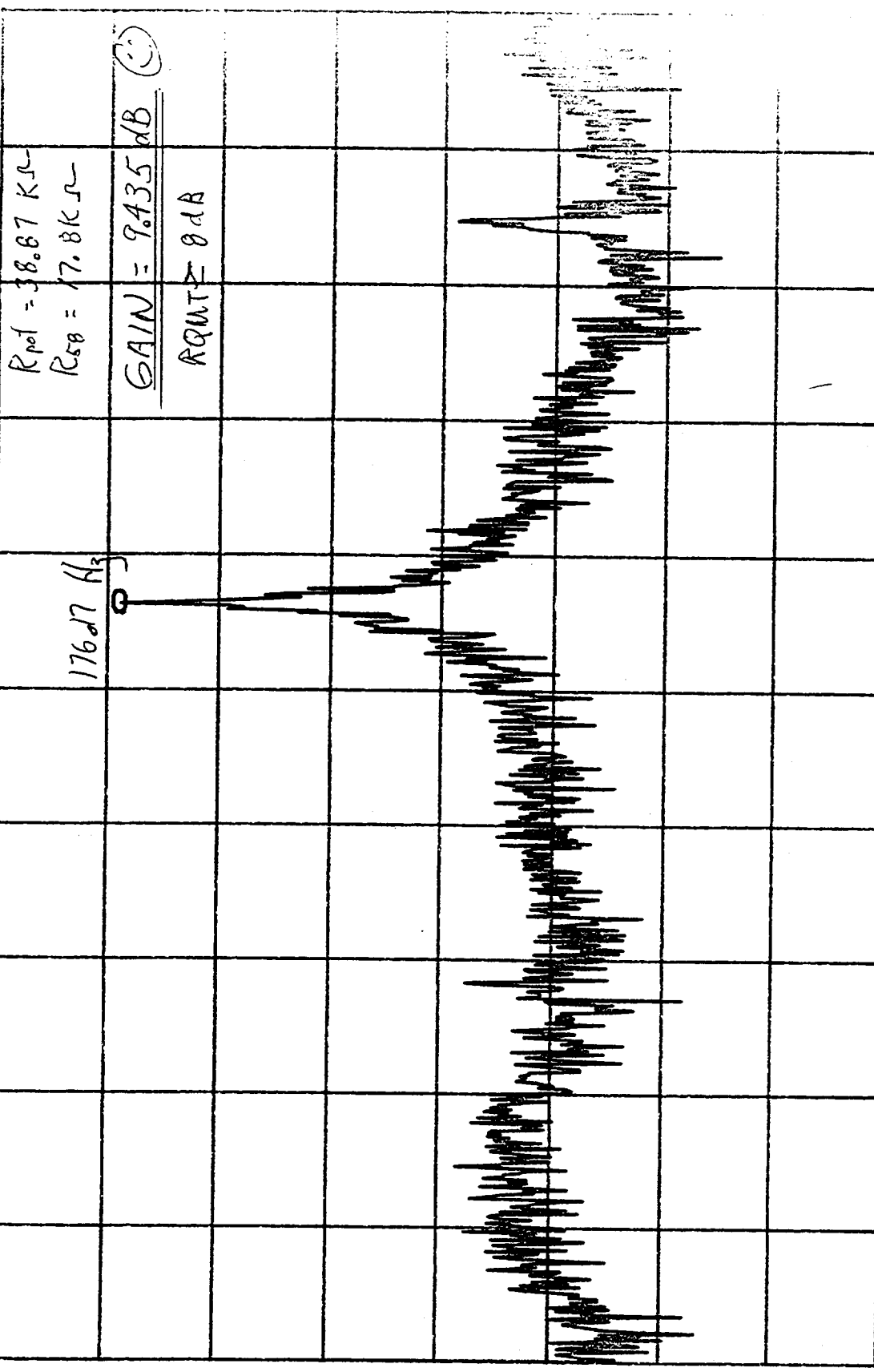
E1-3

X=176.17 Hz
Y=-21.178 dBm rms

POWER SPEC2
-10

3AVG 0%OVL P Unif

DVE



$R_{\text{ref}} = 38.87 \text{ K}\Omega$
 $R_{\text{sub}} = 17.8 \text{ K}\Omega$

$\text{GAIN} = 9.435 \text{ dB}$
 $\text{RQNT} = 8 \text{ dB}$

10.0
/Div

-90.0

FxdXY 0 Hz

130F_P31

A1-1

3.A.A.9

S/C: 373249

P/N: 1331720-2-1T 50' 106

Test Eng:

Quality:

Date: 8-19-99

TA
250

ANS 25 98

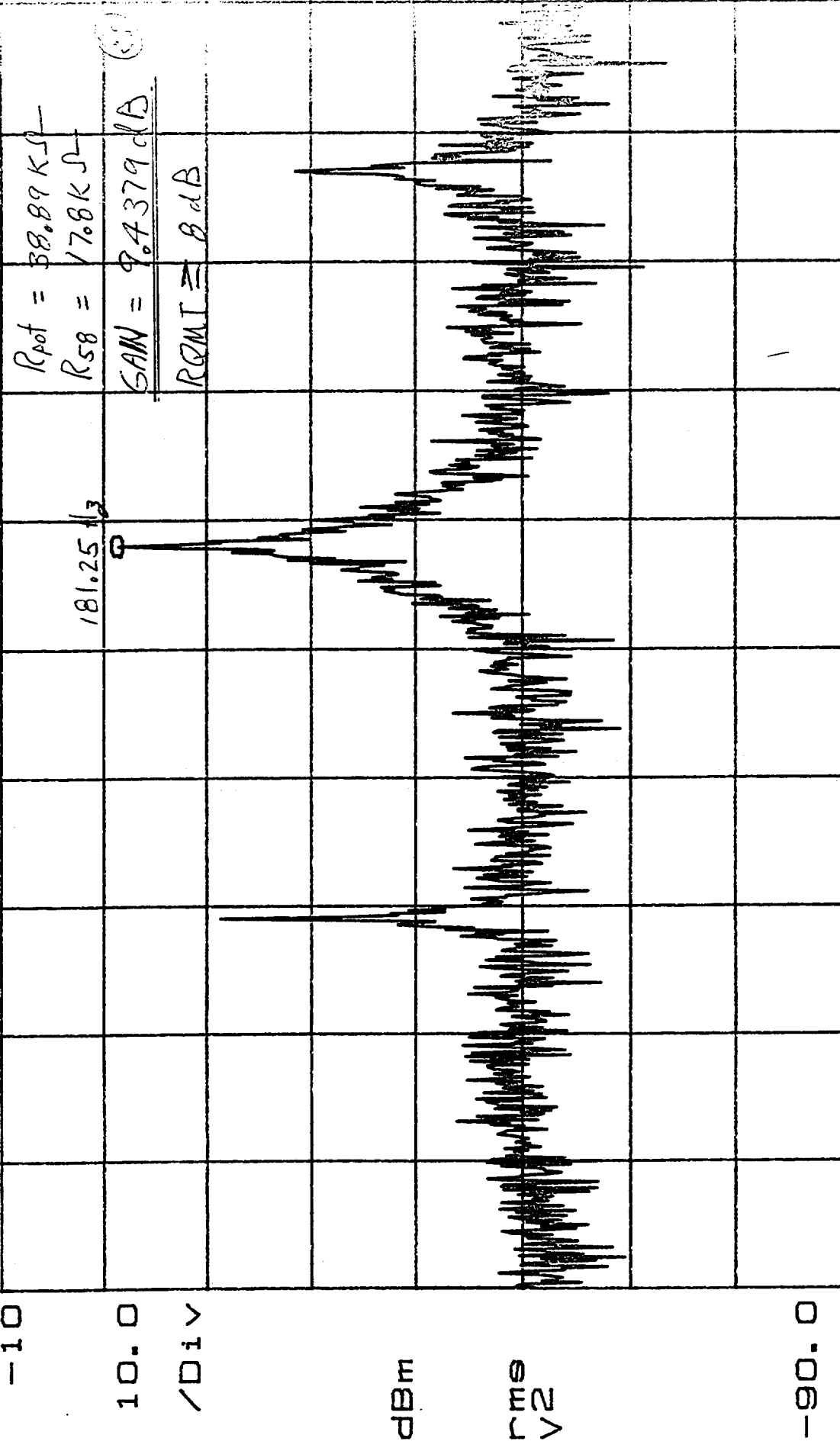
E1-4

X=181.25 Hz
Y=-21.396 dBm rms

POWER SPEC2
-10

3AVG 0%OVP Unif

OV



-90.0

FxdXY 0 Hz

A1-2

120F_P12

312

S/N: 373249

3A.4.8

Test EAG;



Date: 8-19-98

P/N: 1331720-2-17 50' 106

Quality:

AUG 25 '98



E2-1

X=181.25 Hz
Y=-25.826 dBm rms

POWER SPEC2
-10

3AVG 0%OVL P Unif

DV

10.0

/DIV

dBm

rms
V2

-90.0

FxdXY 0 HZ

130F JP22

A1-2

3.4.7.9

S/N: 373249

P/N: 1331720-2-17 S/N: 106

Test Eng:

Quality:

Date: 8-19-98

312

$R_{\text{not}} = 38.15 \text{ K}\Omega$
 $R_{\text{56}} = 17.8 \text{ K}\Omega$

$GAIN = 9.327 \text{ dB}$

$RQMT \geq 8 \text{ dB}$

181.25 Hz

(60)

893
42

100-05-98

E2-2

X=181.64 Hz
Y=-24.217 dBm rms

POWER SPEC2

-10

10.0

/Div

dBm

rms
V2

-90.0

FxdXY 0 Hz

130F_P32

312

S/N: 373249

3.4.4.9 A1-2

Test Eng:

ASU
9
BELT

Date: 8-19-98

P/N: 1331720-Z-1T SN: 106

Quality:

892
42

AUG 25 '98

E2-3

3Avg 0%Ovlp Unif

$R_{\text{ref}} =$

39.9 KHz

$R_{\text{sig}} =$

17.8 KHz

GAIN = 9586 dB

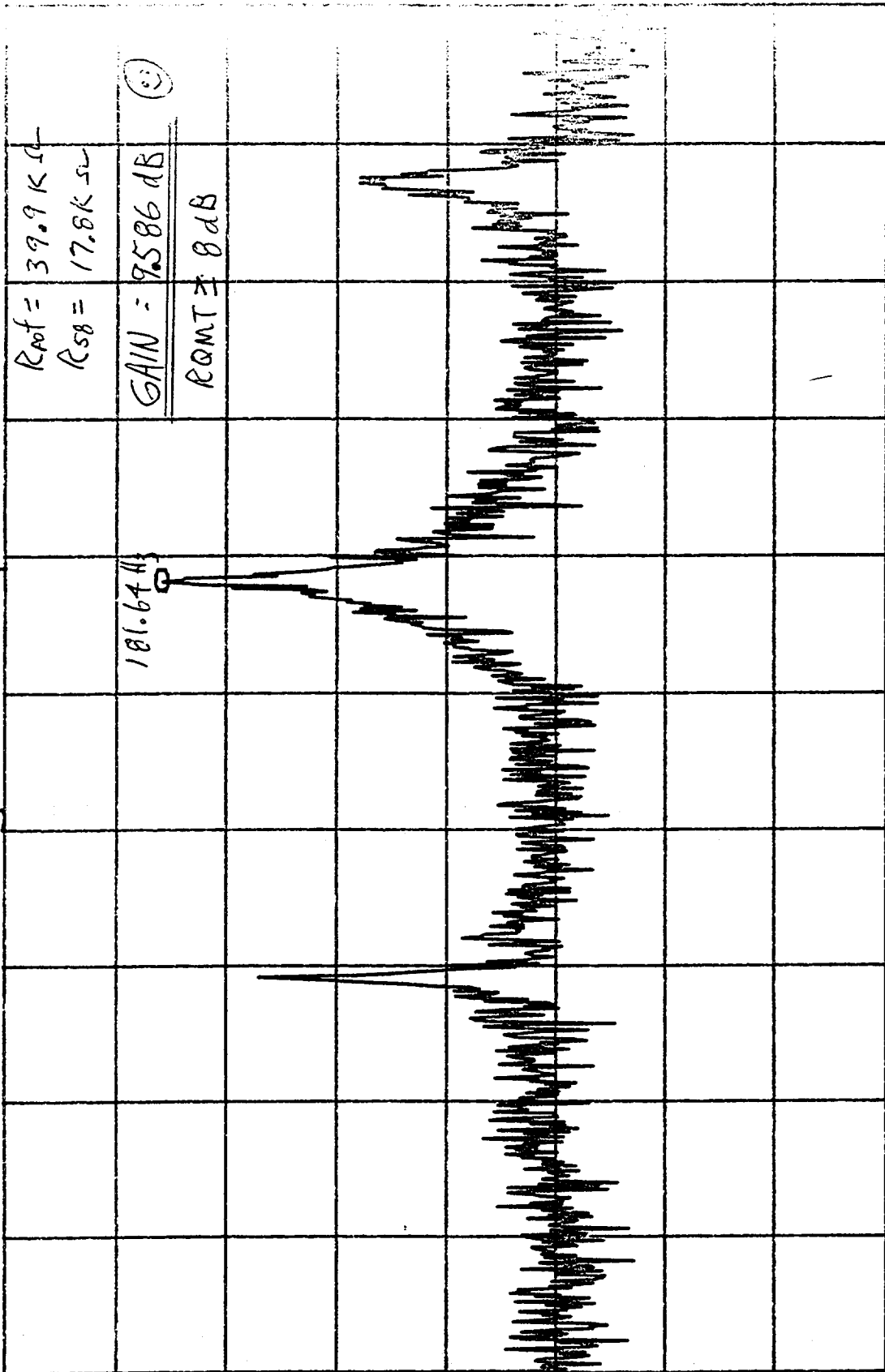
⊙

$R_{\text{QMT}} \pm 8 \text{ dB}$

181.64 Hz

⊙

Over



TEST DATA SHEET 12
Operational Gain Margin (A1-1) (Paragraph 3.4.4.9)

Test Setup Verified: [Signature]

Shop Order No. 373249

Temperature: 71.6 °F 22 °C

Step No.	Requirement	Test Result		Pass/Fail
11	R58 Resistance (kohms)		39.13 K Ω	P
	Test Pot Resistance (kohms)	1	38.84 K Ω	
		2		
		3	38.87 K Ω	
12	Oscillation Frequency (Hz)	1	176.56 Hz	P
		2	176.56 Hz	
		3	176.17 Hz	
16	Gain Margin, 8 dB minimum	1	9.47 dB	P
		2	9.435 dB	
		3	9.435 dB	

Pass = P
Fail = F

Unit: METSAT A1 P/N: 1331720-2-17

Serial No.: 106

Test Engineer: [Signature]

Quality Assurance: [Signature]

Date: 8-24-98

TEST DATA SHEET 13
Operational Gain Margin (A1-2) (Paragraph 3.4.4.9)

Test Setup Verified: *Ray H. [Signature]*
Signature

Shop Order No. 373249

Temperature: 71.6 °F

Step No.	Requirement	Test Result		Pass/Fail
11	R58 Resistance (kohms)			P
	Test Pot Resistance (kohms)	1	38.89 KΩ	
		2	38.15 KΩ	
12	Oscillation Frequency (Hz)	3	39.9 KΩ	P
		1	181.25 Hz	
		2	181.25 Hz	
16	Gain Margin, 8 dB minimum	3	181.64 Hz	P
		1	9.4379 dB	
		2	9.327 dB	
		3	9.586 dB	

Pass = P
Fail = F


Unit: METSAT A1 P/N: 1331720-2-1T

Test Engineer: _____

Serial No.: 106

Quality Assurance: 7A 268

Date: 8-27-98

 NASA National Aeronautics and Space Administration		Report Documentation Page	
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7. Author(s) D. Luu		8. Performing Organization Report No. 11406	
		10. Work Unit No. ---	
9. Performing Organization Name and Address Aerojet 1100 W. Hollyvale Azusa, CA 91702		11. Contract or Grant No. NAS 5-32314	
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12. Sponsoring Agency Name and Address NASA Goddard Space Flight Center Greenbelt, Maryland 20771		14. Sponsoring Agency Code ---	
15. Supplementary Notes ---			
16. ABSTRACT (Maximum 200 words) This is the Performance Verification Report, AMSU-A1 Antenna Drive Subsystem, P/N 1331720-2, S/N 106, for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A).			
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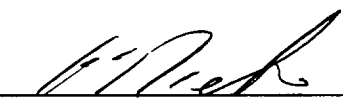
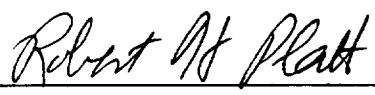
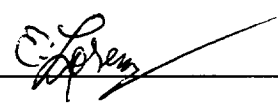
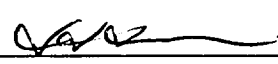

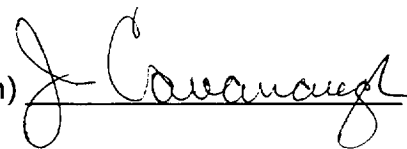
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